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The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.

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Associate Editors: C. L. Dyer, A. E. Heick

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The Farmer's Digest

Vol. II November, 1938 No. 7

Seed Treatment for Small Grains

Condensed from The Southern Planter

OUR knowledge on the subject of seed disinfection has been increased greatly in recent years by the work of the experiment stations and other research agencies.

Until recently our only reason for treating seed grain was to control stinking smut of wheat, loose and covered smuts of oats, and covered smut and stripe disease of barley. It is known now, however, that there are other diseases partially controlled by seed treatment which are often of greater economic importance than those mentioned. These diseases, which manifest themselves in the form of seed decay, root rots, and seedling blights, are caused also by fungi or molds carried over to a large extent on the surfaces of the seed. Because most of the damage by this group of diseases occurs underground, losses caused by them are seldom appreciated by farmers. Thin stands and weak plants caused by these diseases are too often incorrectly attributed to winter killing or other causes.

The prevalence and importance of these root rot and seedling blight diseases and their partial control by seed disinfection make it necessary for us to broaden our conception of seed disinfection and its purpose. A hit-or-miss program in which the seed is treated every two or three years is utterly inadequate to cope with the grain disease situation as we now understand it. Disinfection of seed grains every year is necessary if growers are to obtain maximum profits.

The expansion of our knowledge of seed-borne diseases of grain has been accompanied fortunately by improvements in methods of controlling these diseases. Three different chemicals or groups of chemicals are available to the farmer for the treatment of his seed grains: formalin, copper carbonate, and ethyl mercury phosphate.

Formalin Still Used

Formalin, a solution of formaldehyde gas in water, gives good control of stinking smut of wheat and of loose and covered smuts of oats. For the treatment of wheat the customary recommen-

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dations call for a solution of one pint of formalin in 40 gallons of water. The seed is soaked in this solution for a period of five minutes, during which time the smut balls, which float to the surface, should be skimmed off. After soaking, the seed should be kept covered for four hours and then planted at once. The chief objection to this method of treating wheat is the danger of injury to the seed even when directions are closely followed.

Formalin is more suitable for the disinfection of oats than of wheat. Used in any one of several ways, it does a good job of controlling both loose and covered smuts. The procedure now in most general use is known as the dry, or more correctly, the mist method. One pint of formalin and one pint of water are mixed and the quart of solution is applied to fifty bushels of oats by means of a hand spayer such as is commonly used for fly sprays. As the operator shovels the oats from one pile to another, an assistant sprays each shovelful by three or four strokes of the sprayer.

After treating a few bushels, the amount of solution used should be noted, and the number of pump strokes per shovelful of grain increased or decreased so as to apply the solution at the rate of one quart to 50 bushels of oats.

The treated oats should be left in a pile covered with canvas or other convenient covering for five hours. They should then be uncovered and spread out to liberate the formaldehyde vapors. To avoid injury, oats treated with formalin should be sown as soon as possible. It is advisable to treat on one day only that amount of seed which can be planted the next day.

Copper Carbonate for Wheat

Copper dusts, of which copper carbonate is the usual toxic principle, are suitable for use on wheat, but not on oats or barley. Some of these dusts are essentially pure copper carbonate, containing the equivalent of about 50 per cent metallic copper, while others are sold in a diluted form and contain about 20 per cent metallic copper equivalent.

The recommendations for the use of copper carbonate in the control of stinking smut of wheat vary in different sections of the country. Ordinarily two ounces of the pure or three ounces of the diluted copper carbonate dust is used to each bushel of seed wheat.

Copper carbonate is not soluble in water and does not form a vapor, and hence in using it care must be taken to distribute the dust with great thoroughness over the entire surface of all the seed. Seed treaters which accomplish their purpose by means of a rotating drum or revolving paddles

are suitable for applying copper carbonate dusts provided the treating operation lasts for a period of a minute or preferably two minutes. The shovel method, as described for treating oats with formalin, is not satisfactory for treating wheat with copper carbonate; neither are the gravity type treaters.

Copper carbonate dust on seed wheat reduces the drilling rate by about 10 per cent, and allowance should be made for this in setting the planting rate for the drill.

Copper carbonate has the unfortunate property of hardening like cement if allowed to become wet and then dried. During periods of rains or dampness, the caking of the dust around the working parts of the drill may result in damage when the drill is first moved after a period of idleness. Drill breakage can be avoided by first moving the drill by hand to make certain all parts are working.

The dust may be applied to the seed at any time prior to planting without fear of injury to the seed.

Ethyl Mercury Phosphate for All

The most recent addition to the list of seed disinfectants is a product containing as the fungicide 5 per cent ethyl mercury phosphate. (It is sold under the trade name of New Improved Ceresan, which should not be confused with a product sold for the treatment of cotton seed and known as 2 per cent Ceresan.) It is recommended by the manufacturers and by the experiment stations in most of the important grain growing states as a disinfectant for wheats, oats and barley at the rate of one-half ounce per bushel of seed, the same dust and the same methods of applications being used for all three grains.

Ethyl mercury phosphate is soluble in water and when applied to seeds and exposed to atmospheric or soil moisture, it changes slowly to a vapor form, which accounts for its effectiveness on oats and barley as well as on wheat. Because of its volatile properties, it lends itself well to almost any type of seed treating method. Farmers with small acreages of grain will find it convenient to use the simple shovel method described by the manufacturer. Those with larger amounts of seed to treat have their choice of any of the rotary or gravity type treaters, either home-made or commercial, commonly used for the purpose.

In using this dust, excessive dosages should be avoided. Any quantity of dust above one-half ounce per bushel of seed is simply a waste, and dosages in excess of four times that amount may cause injury to the seed. Although it is recommended that seed should not be treated with ethyl mercury phosphate more than three months before plant-

ing, it is probably true that seed which is well cured and dry at the time of treatment will not be injured even if stored from one planting season to the next.

Because of the low rate of application and the physical properties of the dust itself, seed treated with ethyl mercury phosphate dust flows through the drill at the same rate as untreated seed, and hence no correction in the drill setting need be made.

Handle Chemicals With Care

Improvements in seed treating chemicals available for controlling seed-borne disease have been accompanied by advances in the field of seed treating equipment. The capacity of seed treaters has been increased so much that on the average farm the seed treating job takes only an hour or so. Commercial and even home-made treaters with capacities of fifty to one hundred bushels of seed per hour are in common use. Plans or patterns for the construction of rotary and gravity type treaters costing only a few dollars can be obtained free.

Now for a word of precaution in handling seed disinfectants. Remember that all of them are poisonous and handle them, as you do gasoline, with proper respect for their dangerous properties.

No seed treating chemicals should be inhaled in large quantities. Never use them in a closed room. Whenever possible, do the seed treating job out-of-doors. If it must be done indoors, then provide cross ventilation.

Minerals for Dairy Cattle

Condensed from Eastern States Cooperator

Dr. J. G. Archibald

Massachusetts State College

THREE—Digest (Nov.) —al

MUCH has been said and written during the past two decades on this subject. The experiment stations in this country and throughout the world have conducted much careful research on the requirements of cattle and other animals for minerals. As with all new developments their findings have been seized upon by commercial interests and used as sales arguments for all sorts of mineral supplements which have sold at fancy prices and taken a needless toll of the farmer's hard-earned cash. This article is a brief summary of our present knowledge regarding the need for mineral supplements and how that need can be met.

There are 13 mineral elements that are now definitely recognized as essential to animal life; later research may add to this list, but it seems doubtful if any not now included will ever be of interest from a practial standpoint. Table 1 lists these minerals in the order of probable deficiency together with their principle known functions.

Note that only nine of the 13 are ever deficient, and of these nine only the first four are of much interest to farmers in the eastern states. Let us consider them in the order in which they appear in the table.

Sodium and Chlorine

These are the elements of common salt. Under conditions existent in eastern North America salt must always be supplied to our livestock. One percent of it in the grain mixture is the most practicable method of insuring an adequate supply. When little or no grain is being fed, blocks of rock salt protected from wastage by rain may be placed where the animals can lick them at will.

Calcium

Deficiency of calcium is most often seen in heavily milking cows, especially if they are not receiving leguminous roughage, and the roughage has been grown on acid soils. Average producers (7000-8000 pounds a year) seldom suffer from calcium deficiency. The photograph on this page shows a cow in an advanced stage of the trouble. Such animals are usually stiff in the hind quarters,

Reprinted by permission from Eastern States Cooperator, Oct., 1938, Springfield, Mass.

TABLE 1

Mineral Elements Essential to Animal Life and Their Functions

Group and Element	Function
Always Deficient in roughage, grain by-products, and cereal grains:	
Sodium (These combined form common salt.)	Occurs in all body fluids; of great importance for maintaining cell equilibrium and neutrality.
Chlorine	Combined with sodium is an essential part of the blood; required for formation of the acid in gastric juice.
Often Deficient:	
Calcium (These combined form phosphate of lime.)	In conjunction with potassium and sodium it regulates the heart beat and muscular activity generally; important constituent of bone; essential for clotting of blood.
Phosphorus	Necessary for proper development of the nervous system; combined with calcium it is an important constituent of bone; also a constituent of certain fats and proteins.
Sometimes Deficient:	
Iron	Necessary for development of the red coloring matter of the blood.
Copper	Associated with iron in blood formation.
Iodine	Necessary for the proper functioning of the thyroid gland.
Cobalt	Only recently added to the list. Function not clearly understood. Traces of the element prevent certain types of anemia.
Rarely, if ever, Deficient:	
Magnesium	Closely interrelated with calcium; necessary for proper formation of teeth; a minor constituent of bone.
Never Deficient:	
Potassium	Acts interdependently with calcium and sodium. (See above.)
Manganese	Seems to have a specialized function in reproduction.
Sulphur	Necessary for growth of hair, wool, hoof, horn; constituent of glutathione and vitamin B.
Zinc	For proper growth of fur in fur-bearing animals.

and their bones are easily broken. Milk yield may be greatly reduced. Prevention is the best remedy as cases of long standing do not respond readily, if at all, to treatment.

The best insurance against calcium deficiency is high quality roughage, with a liberal amount of legumes in it. Where it is impracticable to grow or purchase legume hay the needed calcium may be supplied in the form of finely ground high calcium lime-

stone incorporated in the grain mixture at the rate of 40 pounds in a ton of grain. High producing cows should be given a six-weeks' to two months' dry period to enabe them to restore to their bones the overdrafts of calcium removed during the previous lactation.

Phosphorus

Unlike calcium the phosphorus of a cow's ration comes very largely from the grain, especially from such feeds as wheat, bran, and cottonseed, linseed, or soybean meals. Because of this and because dairy cows, especially in the eastern states, are usually fed a fair to liberal allowance of concentrates, phosphorus deficiency is only rarely seen among milking cows. It occurs most frequently among cattle on range that are not receiving grain, especially if the grazing has become of poor quality, as is often the case after a long dry spell. In the eastern states it sometimes appears among young cattle or dry cows on pasture, especially toward the end of a dry summer. The surest symptom of it is a tendency to chew bones, old shoes, or similar rubbish.

Here again the best remedy is prevention. Provide a mineral "lick" to which the cattle have free access. A suitable mixture consists of equal parts of common salt and *edible steamed* bone meal. Place the mixture in a shallow box or trough made of stout lumber, securely fastened to a tree, or between two posts, or to the side of a building in some part of the pasture frequented by the animals. Provide some sort of protection for it from summer showers which would quickly wash out the salt and leave behind the less palatable bone meal. The self-feeders used for hogs, or the larger ones used for poultry are readily adapted for the purpose.

Iodine

Iodine deficiency, as indicated by the occurrence of simple goiter, is rarely seen among our livestock in the New England or North Atlantic states, for the reason that our natural drinking waters and the crops grown on our soils contain the very small trace of iodine necessary for proper functioning of the thyroid gland of animals.

The only exceptions to this statement might be (1) certain localities in the higher mountainous regions of northern New England, New York, and Pennsylvania; and (2) those rare instances where all feed, roughage as well as concentrates, is purchased. If all feed so purchased came from those areas in the Middle or Far West where iodine is known to be deficient then it is conceivable that an iodine deficiency might develop as a result of using such imported feed.

In any case, rare or otherwise, iodine deficiency can be readily recognized in the birth of hairless pigs, and big-necked colts, calves, lambs, or kids. Fortunately, repetition of such occurrences is readily preventable. Simply iodize the regular salt allowance by adding half a pound of sodium iodide to a ton of salt; for smaller amounts the proportion would be a scant half-ounce of the iodide to 100 pounds of salt. (All Exchange rations contain iodized salt.)

Other Elements

The only other elements that it is necessary to consider as ever deficient in practice are iron, copper and cobalt. All of these are associated in the function of

TABLE 2

Supplements Commonly Used for Supplying Minerals Which May Be Deficient

Mineral Supplied	Substances used as mineral supplements[1]		
	Chemical Name	Common Name	Various Forms on Market
Calcium	Calcium Carbonate	Carbonate of Lime	**GROUND LIMESTONE** Oyster shell calcite
	Calcium Hydrate	Hydrated Lime	**Builders' Lime** Chemical hydrated lime
	Calcium Sulphate	Gypsum or Land Plaster	(See next column to the left)
	Calcium Phosphate	Phosphate of Lime or Bone Phosphate	Raw rock phosphate Raw bone meal **Steamed bone meal** **EDIBLE BONE MEAL** Bone black
	Di-calcium Phosphate	None in general use	**DI-CALCIUM PHOSPHATE (technical grade)** Acid phosphate or Superphosphate
Phosphorus	Calcium Phosphate Di-calcium Phosphate	See above	See above
Iron	Ferric ammonium citrate	Iron ammonium citrate	F.A.C. (U.S.P. grade, brown scale-like crystals or yellowish brown powder)
	Ferric oxide	**RED OXIDE or IRON** Venetian red	(As in previous column)
	Ferric sulphate	Iron sulphate Green vitriol Copperas	One form only—known by any one of the three names in previous column
Copper	Copper sulphate	Blue vitriol Bluestone	One form only—known by both names
Iodine	Potassium Iodide Sodium Iodide	**Iodide of Potash** **Iodide of Soda** }	Technical Grade of these
		IODIZED SALT	Any good brand or home-mixed
		Dried Kelp (a seaweed)	A brown powder of medium fineness

[1] Substances in boldface capital letters are our first choice for dairy cattle—those in boldface small letters would be second choice.

blood building, and under certain rather rare soil conditions they may be so deficient in roughages that animals fed continuously on such roughage develop a disease known technically as "nutritional anemia," but characterized by various local names in different parts of the world.

The trouble is confined to regions where the soil is very sandy, hence is usually found in coastal areas. Animals removed to so-called "healthy" areas a few miles inland seem to make a remarkable recovery. The only area in New England where "nutritional anemia" has been definitely recognized as such is in southeastern Massachusetts, along the shores of Buzzards Bay and Cape Cod Bay, where it is known as "neck ail." The trouble is readily cured by feeding the affected animals roughage grown on soils not deficient in these elements. In those limited areas where it is known to occur it may be prevented by allowing the animals access to a "salt lick" composed of 100 pounds common salt, 25 pounds of red oxide of iron, and one pound of finely ground copper sulphate. The copper sulphate must be thoroughly mixed with the other ingredients, as it is poisonous to cattle if eaten in quantity. Fortunately, many iron compounds contain sufficient cobalt as an impurity to provide the trace of it needed to correct the trouble. Some investigators claim that cobalt alone is the curative agent; this point is not yet definitely settled, but from the standpoint of practice it is probably unimportant.

Table 2 contains a list of the substances commonly used as mineral supplements, and the various forms they occur in, those which are preferred being suitably indicated.

In conclusion it must be stated that mineral supplements should be fed only when the conditions indicate a definite need, and then only those specific substances should be used which will supply the particular deficiency in a cheap and readily available form. The indiscriminate general use of such materials, either singly or in complex mixtures, regardless of the need for them, is not sound feeding practice.

Permanent Clovers for Permanent Pastures

Condensed from Better Crops With Plant Food

A. R. Midgley

Agronomist, Agr. Exp. Station, Burlington, Vermont

WHAT place does clover have in permanent pastures and what is the relative value of individual strains with different fertilizer treatments? To determine these questions considerable research work has been conducted at the Vermont station, using Ladino, common white Dutch, English and natural wild white clovers.

Characteristic Growth

Ladino is a mammoth white clover which originated in northern Italy and was brought to this country in 1912. It has an erect habit of growth with large leaves and long stems, which enables it to compete with the tall-growing grasses. Ladino, however, cannot stand as close grazing as the other clovers because of its erect habit of growth, large fleshy runners which are quite easily injured by the tramping of grazing stock, and its long internodes which do not form a very close turf. It has a remarkable comeback after being cut or grazed and under proper conditions yields more than other clovers.

Common white Dutch clover has growth habits intermediate between the Ladino and wild white clovers. The plants have larger leaves, fewer and stouter runners than the wild white types, and because of its longer internodes it does not root or spread so readily. It usually has a longer growing season, since it often starts growth earlier in the spring, blooms 1 to 2 weeks earlier, and continues growth later in the autumn than the wild strains.

English wild white clover has very small leaves, short stems and internodes, and forms a close, compact turf. This plant is much smaller than the other clovers and thus requires close grazing to get sufficient light in competition with other, taller-growing plants. England has found this clover to be a true perennial, a long-lived, persistent, rapidly spreading type. It has been the main contributing factor in making the pastures and livestock of Great Britain so famous. Their pastures are seldom if ever plowed, and they take great pride

Reprinted by permission from Better Crops with Plant Food, Aug.-Sept., 1938, Investment Bldg., Washington, D. C.

in referring to their "old pastures." Seed from these old established pastures are used for the reseeding of other pastures.

Natural wild white clover has growth habits intermediate between the small English wild white and common Dutch varieties forming a close, compact turf. This clover is found in old permanent pastures or comes in under proper fertilization and management. It is quite likely that these plants are the more persistent strains which originated from the common white Dutch clover, as available evidence indicates that this clover is a native of Europe and was brought to this country by the early settlers in hayloft sweepings. It took root readily and is now found along practically every road and forest trail. Some Indian tribes called this plant "White Man's Foot Grass," as it seemed to follow white men, establishing itself readily on newly cleared or burned-over forests where fertility and organic matter contents were high. Natural selections have no doubt taken place, and as it readily establishes itself under proper conditions, it can well be called natural wild white clover.

Experiments were started in the spring of 1934, using these four clovers, on three different soil types. Since the data from the three experiments were similar, only one will be discussed here. Woodbridge loam, because of its importance as pasture land, was selected for one of the trials. This soil occupies the gently rolling hillsides in the north central plateau of Vermont. It is derived mainly from granite, and while it is non-calcareous at all depths, it is not so acid as to prevent a good growth of pasture clovers and grasses (pH 5.6). While this area has a rolling topography, it is still quite ideal for pasture clovers, because its compact substratum (hardpan) retards the movement of water and thus supplies sufficient moisture.

A sufficient area was plowed, fitted, and seeded to Ladino, common white Dutch, and English wild white clovers. Adjacent unplowed areas containing some native wild white clovers were used as the fourth type, since seed for these plantings were not available. Ladino and Dutch seed were obtained from a reliable seed house, English wild white seed directly from London and was certified as "Genuine Kent wild white clover from old pastures." Seeding was done at the rate of 5 pounds per acre, which is in excess of the normal rate but deemed advisable to insure good stands. Normal seedings of timothy and Kentucky bluegrass were used with the clovers in order to simulate pasture conditions.

A part of each plot was enclosed within a wire fence, the remainder being subjected to actual grazing conditions. Yield data were obtained only on the enclosed areas. The plots were cut frequently when 4-6 inches high, in order to favor clover rather than the grass.

The results show the superiority of natural wild white clover in persistence and longevity. It continued to increase each year, while the other clovers greatly decreased after the third growing season. Why natural wild white clover is more persistent than the other clovers is not definitely known, but it is true that white clovers growing in various habitats show marked differences, such as size and number of leaflets, length of nodes, manner of growth, color of flower, etc. It is likely that some strains have a deeper root penetration and are thus better able to withstand drought and midsummer heat, as well as utilize to better advantage soil minerals which are more or less held in difficultly available forms.

The creeping stems or stolons of wild white clover are small and tough, so they may not be injured by tramping and grazing stock to the same extent as the types with more fleshy stems. They also tend to stop active growth earlier in the fall and thus store more food reserves in their roots, which would help make them more resistant to heaving and winter-killing. It is possible that they are more resistant to diseases, more tolerant of soil acidity, and produce more seed under close grazing, but whatever the cause, natural wild white clover is more persistent than the other strains that have not been subjected to soil and climatic conditions peculiar to a particular locality.

The common white Dutch decreased most rapidly, as very few plants remained after the second year. It may even be that some of these plants reported in 1936 came from seed which failed to germinate the previous year or was an incropping of the natural wild white clover, as these two types are difficult to differentiate. It is little wonder that white Dutch is not more persistent, as much of the seed is produced in foreign countries or in the southern States where the climatic conditions are very unlike those in the northeastern States.

Ladino clover seldom lives more than 2 or 3 years in Vermont, but it was somewhat more persistent than the common white Dutch variety. Here again, part of the plants recorded in 1936 may have been from seeds which failed to germinate the previous year, or came from freshly produced seed.

Though the English wild white

(Kent) is considered a true perennial in England, it also rapidly decreased in these experiments. It is possible that this clover may have been more persistent if the plots had been cut more frequently; but in actual practice, especially under rotational grazing, it is doubtful if the plots would have been more closely grazed, since they were cut five or six times a season when growth of 4 to 6 inches was attained. This clover may also have been more persistent if the original sod could have been utilized, but since the land was plowed in preparing the seed bed, the organic matter was turned under and was then positionally unavailable to the clover.

Fertilizer plays an important role in maintaining pasture clovers. The high rate of superphosphate with manure proved best in this respect. Manure not only supplies potash, but soluble organic matter and minor elements which have a beneficial effect in maintaining and establishing clovers. "Night pastures," which naturally receive large amounts of manure, usually have a good stand of white clover. This is not due to its nitrogen content, since this usually decreases the percentage of clover.

The results show that yields are greatly increased by the use of fertilizers, and that this yield is in proportion to the fertilizer used. While nitrogen and minerals gave the greatest total yield, the added nitrogen did not give sufficient increase to pay for its use. This would be expected under these conditions where a good stand of clover was present, since the latter does not respond to additional nitrogen.

The high rate of potash and phosphorus was very much better than the low and shows the desirability of applying a heavy initial application on potentially good clover land. Merely plowing and reseeding without adding sufficient fertilizers are usually a waste of time and seed, and on heavy soils a poor turf is obtained which allows the soils to bake. Plowing is usually unnecessary in establishing a good pasture high in natural wild white clover, because under proper conditions it usually "comes in." In fact, plowing is usually detrimental, since it turns under the surface layer of organic matter and places it in a position where most of the feeding roots cannot reach it. In addition to the ordinary physical and chemical properties attributed to organic matter, it seems to supply food and proper conditions for the clover organisms. A small application of farm manure on clover pastures seems to be much more beneficial than an equivalent amount of mineral fertilizer. Some of the best clover pastures in England

are never plowed, and they realize that it takes a long time for good pastures to develop, during which time a surface layer of dark humus is produced.

Keep in Permanent Pasture

Since it is quite difficult, if not impossible, to purchase natural wild white clover seed, the land should not be plowed, but kept in permanent pasture so that these plants might develop. It is quite difficult to understand where the seed comes from, but it is known that white clover produces a large number of "hard seed" which do not absorb water and thus remain dormant for a long time. That a large number of seed are transferred about the grazing stock is also known, which is evident by the large number of clover seedlings which germinate in the dung deposited by cattle on pastures.

Pasture clovers require plenty of available phosphorus and potash for adequate growth, and since most pastures are low in these minerals they must be applied in the fertilizer. While natural wild white clover will tolerate rather acid soils, some lime is very desirable, as it helps to keep the minerals more available.

Most dairymen make the mistake of not applying sufficient phosphorus and perhaps potash as an initial application, particularly on run-down lands that are potentially good clover soils. It should be remembered that myriads of soil organisms are stimulated by the use of fertilizers, and these organisms must first have their wants supplied before any are available for crop plants. Repeated observations, as well as some experimental data, indicate that 1,000 pounds of 16% superphosphate (800 lb. 20%) together with 150 pounds of muriate of potash may well be used as an initial application on potentially good permanent pastures to establish and maintain wild white clover. Less potash may be used on heavy soils, but on sandy loams more potash and less phosphorus may be desirable.

Close grazing is very important in establishing and maintaining wild white clover. This is especially true in early spring, since most grasses make their maximum growth sooner than clovers and thereby shade and crowd out the latter. A clover-dominant or grass-dominant pasture may be secured by changing grazing methods, the former by close grazing which checks the growth of grass, the latter by allowing the grass to grow up and check the clover.

On clover-dominant pastures, stock should be turned out as soon as the ground is dry enough to carry them. In spite of this early grazing, some grasses will reach the heading-out stage and should be cut with a mowing

machine. At times more than one mowing is necessary, but this is a good practice, as waste is reduced and more pasturage made available. In a partially withered condition, freshly cut herbage is readily eaten by stock, and a splendid new growth replaces it. Animals usually avoid vegetation around their droppings, but since the mower cuts and carries the herbage a short distance away, it is readily consumed.

Considerable care should be exercised in the use of nitrogen on permanent pastures where wild white clover is to be maintained. A small amount with minerals usually aids this clover in getting established, especially on run-down soils, but after a good stand is obtained, additional nitrogen should not be used because it tends to crowd out the clover. Improper use of nitrogen with its accompanying increase in growth of grasses often accounts for failure to maintain a good clover sod. However, an initial application of complete fertilizer containing nitrogen is often advantageous on run-down permanent pastures, because it increases yields and gives a quick visible response while the natural clover is getting established.

Rather large amounts of nitrogen may be advantageously used on semi-permanent or meadow pastures, when this type of pasture is used in conjunction with a permanent one. Tall-growing hay-type grasses respond readily to this treatment and will give extra grass for early-cut hay or grass silage. This allows an aftermath to follow which is used when most needed in late summer.

Most dairy farmers, especially in New England where wild white clover can be grown, should consider the possibility of having these two types of pastures—permanent pastures where wild white clover supplies the needed nitrogen and semi-permanent or rotational pastures where nitrogenous fertilizers are used to supply the taller-growing grasses. Both fertilization and management of these two types are very different and must be understood for successful results.

Why Do Chickens Lay Such Eggs?

Condensed from Everybodys Poultry Magazine

V. D. Chamberlin

Ohio Experiment Station

IF you have never gathered a double-yolk egg when making the rounds of the nests, your flock would be one of those rare exceptions. Double yolks are among the most common types of abnormal or freak eggs. But there are other types of abnormal eggs, some of which occur quite frequently and others which are very rare.

Some abnormal eggs are characteristic of certain families of birds. Others occur when the hen's egg making machinery is temporarily thrown out of kilter. Extreme warm or cold spell, for example, may increase the number of freak eggs. Faulty feeding can have a similar effect. It isn't always possible, however, to determine why chickens lay abnormal eggs, even though we can tell what has happened.

Let us review some of the common types of abnormal eggs, the manner in which they are formed, and what, if anything, can be done about them.

Double-yolk eggs are very common and can easily be detected by separate yolk shadows seen before a candle, if the size is not sufficient indication. These eggs are as good as any, but are very difficult to keep uniform and are separated from the other salable eggs and generally used at home. They result from a disturbance of such a nature that two yolks get into the oviduct at nearly the same time and become surrounded by common layers of albumen, shell membranes and shell. Eggs with three yolks have been reported but are very rare.

Records kept at the Maine Experiment Station have shown that two-tenths of 1 per cent of the eggs were double-yolked produced over a long period of time. Some hens have a tendency to lay double-yolked eggs, but the big majority never lay anything but normal single-yolked eggs. Double-yolked eggs occur in the pullet flocks more frequently than in flocks that have been through a molt period.

Soft shelled eggs or eggs having no shell are sometimes produced. The immediate cause is the failure of the shell forming glands in the uterus to function

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properly. This failure of shell formation may be caused by a lack of shell material, and if discovered, can be corrected.

Some hens lay eggs with hard, but very thin and porous shells. These are said to have poor keeping qualities and are avoided by storage men. These defects occur more frequently in the periods of heavy production and in flocks of specialized poultrymen where the birds may be forced for heavy production. Or they may be caused by the fowls being frightened and handled roughly so as to prematurely detach small yolks leading to troubles with the egg organs.

This problem need not be acute if sufficient lime or shell forming material is provided the laying flock. A ration containing fish oil, such as codliver oil, or sardine oil, particularly in the parts of the country where the sunshine is short, will add sufficient vitamin D to enable the birds to make use of the calcium or lime given.

Dwarf eggs are familiar to every poultry keeper. They contain no definite formed yolks and seem to consist of nothing but a small shell filled with albumen. The production of these variously called small eggs is supposed to mark the end of a laying period. In fact, they may be produced at any time. Apparently, small eggs result from a stimulus in the oviduct of a minute foreign body of blood, or a piece of yolk causing a secretion of albumen, shell membranes and shell, though in many cases no part of yolk or foreign body is visible.

Blood clots and bloody eggs are probably the most common faults arising in the ovary. The blood spot usually appears on the side of the yolk when the egg is candled. These blood clots are caused by the rupture of a blood vessel in the ovary, the blood collecting on the side of the yolk. This rupture may be the result of an abnormal condition, as the rupture of the yolk sac in some place other than at the point intended or a small blood vessel extending across this line of cleavage. The blood either remains on the surface of the yolk appearing as a streak or clot, or diffuses through the albumen causing a bloody white.

Eggs that contain blood clots, but are not bloody are satisfactory for use if the clot is removed. The cause of the imperfection is not generally understood by consumers, who confuse them with partially hatched eggs. They should be removed and not marketed.

Frightening of the layers is a cause of blood spots and, in some instances, the cause of an epidemic of blood spots in a given flock after a bad fright. Jumping to and from high roosts

may be a cause in some instances.

Occasionally foreign substances resembling flesh are observed floating in the egg white or attached to the chalazae. These spots are called meat spots and vary in size and color depending on the source of origin. Abnormal growth of tissue or portions of gland tissue loosened and torn from the wall of the oviduct as the egg passes through. Meat spots are often confused with blood clots or dense chalazae in candling. Meat spot shadows are darker than chalazae or blood clots. These defects can be removed and the egg is suitable for food.

In rare instances, an egg is laid within an egg. Some abnormal conditions causing a reverse of peristaltic action may force the egg back up the oviduct until normal forces again push it along its regular course. The first egg is usually an abnormally small one in this case and may be a cause for the reversal of peristaltic forces.

"Grass eggs" are those with olive-colored yolks or those with greenish whites, when candled. Excessive consumption of green food, such as occurs when hens are given access to range in the spring, darkens the yolks. Certain bacteria may cause a dark yolk if held in some moist places.

Rations high in cottonseed meal are known to produce eggs with dark spots on the yolks. Eggs from birds fed over 10 per cent cottonseed meal in the ration should not be stored as discoloration of yolks develops rapidly in cold storage. Eggs with dark greenish yolks are unfit for food purposes.

In the normal egg the air cell develops at the large end of the egg by separating the two shell membranes and filling this space with air. Best quality eggs should not have over one-eighth inch depth of air cell and be in a fixed position and not movable. Rough handling of eggs is sure to cause deterioration even though the shell is not broken. Often times the shell membranes are broken and the chalazae are detached, permitting the yolk to settle and stick to the shell. When the air cell is loose and moves it is usually termed "floating air cell." Such eggs are not necessarily bad, but show effects of rough handling, and evaporation takes place more rapidly, and the albumen becomes watery.

Market men speak of "light float" as a term meaning inferior eggs.. The yolk is dark and has a large air cell. "Heavy float" is the term meaning a more serious defect and more advanced stage. The frequent gathering of eggs and the elimination of broody hens aid somewhat in preventing this condition.

Heat spots develop under summer temperature conditions if fertile eggs are not cooled to 68 degrees Fahrenheit immediately after they are laid. Forty degrees is the ideal temperature. If fertile eggs are not properly cooled, a reddened spot appears on the yolk and the embryo partially develops. This development is slower than at incubator temperature of 103 degrees Fahrenheit but the germ soon dies and a very inferior product is the result.

The presence of males in a flock is undesirable for the production of market eggs and males should be penned separate from females, except during the breeding season. Sometimes, because of fright or rough handling of birds, the egg will be held in the body of the bird several hours after it is complete. If fertile, incubation begins and results in a defective egg.

Rough handling or excitement may cause the egg to be checked or broken while the shell is being formed. More lime is deposited over the crack resealing the egg and often leaves a slight ridge or line and is designated as a "body check." The shells are usually weakened and are likely to become broken in handling or shipment.

Moldy or musty eggs develop inside or outside of the shell, especially if the shell is cracked. Molds develop rapidly when there is warmth, plenty of moisture and a lack of ventilation. There is usually a pungent odor developing with molds which is imparted to surrounding eggs. Use only clean cases, flats and fillers.

Some types of abnormal eggs cannot be controlled by any known methods. Breeding and selecting only those birds producing normal eggs should be practiced, as heredity plays an important part in egg size, shape, color and interior quality. Finally, a well balanced ration and good management will yield better returns and oftentimes largely eliminate losses due to abnormal eggs.

Ethics in the Sale Ring

Condensed from Sheep Breeder

J. F. Walker

FOR many years I have been interested in the selling of purebred livestock at auction sales. During this time I have acted as buyer, seller, spectator, manager and, on one or two occasions, occupied the auctioneer's stand. I have also attended some of the leading sales in some foreign countries and out of this varied experience it has occurried to me that some observations on the ethics of the business might be in order.

In every sale we find four groups: first, the seller or sellers; second, the auctioneer and his assistants; third, the buyers, and last, the spectators who are not interested in purchasing but do want to see how the offering sells.

Naturally the seller wants to secure the high dollar and the auctioneer is employed to get it for him. His interests are opposed to that of the buyer who is trying to purchase as cheaply as the competition permits. Out of many years of auction selling, a standard proper business procedure, or a code of ethics, has been developed, which when followed assures a fair deal to all. Failure to follow this code has resulted in many unsuccessful sales or in others being discredited. The hope is that this article may call attention to some of the more important factors involving a permanently successful auction system of selling purebred livestock.

Let us first consider the ethics of selling. Every seller should clearly and definitely set out the terms of sale to avoid any misunderstanding. Any known defects should be called to the attention of the buyers. Any animal passing through the ring and showing evidences of disease should be sold to be right at time of delivery unless specifically sold at buyer's risk.

The seller has the right to present his offering in the most attractive manner possible. He is perfectly within his rights to play up the breeding to the best advantage, but the too common practice of going back five or six generations to find a good ancestor and then selling on this remote blood is hardly ethical.

The seller has a right to expect an honest appraisal of values by the buyers and, in the event he is unable to obtain them, to place a reserve bid or stop further selling. He has no moral right to by

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bid on his offering or to permit his auctioneer to do this by carrying an animal up because one particular individual is willing to go that far. This practice seems peculiar to our country and would not be tolerated in other countries where most of the purebred stock is sold at auction sales.

A mail order bid should be handled the same as though the buyer were present and not run to the price limit set unless absolutely necessary.

Wash sales or "you buy my sheep at a long price and I'll buy yours the same way." are a curse to the business and do much to cause buyers to lose confidence in the game. They are generally detected and, while they occasionally catch a sucker, they backfire just as often.

Buyers who bid in animals should be prepared to meet the terms of the sale unless arrangements have been made otherwise before purchase. Transfer of property becomes effective on payment for the same and subsequent risks are those of the purchaser unless otherwise stated.

Transfer of pedigrees should be prompt and, in case of bred females, service certificates should accompany the papers to the new owner.

On consignment sales the managers have the right to assume that all stock listed will be offered at the sale. Most of the charges incident to holding a sale are fixed ones, and profit depends very largely on volume of the sale. Many consignment sales require a deposit at time of entry which is forfeited if the animal is not offered. An exception occurs where buyers are not enough to absorb the offering at fair values. Here there is a perfect right to stop selling to protect not only the owner but also those who have paid fair prices earlier in the sale.

Among buyers one sometimes encounters a "syndicate." Where prospective buyers are few, a group may get together and combine their purchases to eliminate competition. This practice is the same as "price boosting" with the shoe on the other foot and both forget the prime purpose—an auction, namely, to secure values arrived at through independent competition. If buyers would remember that some day they very likely will be sellers and sellers would recall the attitude they had as buyers, the situation would soon take care of itself.

There is another element that enters into every sale—the ringside spectator. He is of many types and frequently presents a problem. He may, and generally is, courteous and attentive to the auctioneer to avoid confusion, or he may be the opposite and try to live up to the reputation he acquired when he was a year and

a half old and his father and mother decided he was very smart.

He may try to occupy all the good seats or he may take a position where he will not interfere with buyers. He even may, in an unguarded moment, break out and start buying and buy heavily. Such things are not uncommon and the spectator is always, therefore, welcome at any sale and his code of ethics is quite simple—not to do anything to interfere with the sale.

There is one more element frequently encountered at live stock auctions. That is the kind of person who takes advantage of these gatherings to peddle his own wares.

He works in various ways. He may damn with faint praise, he may put his face through various contortions when animals are being sold, indicating that he has not reached the intelligence plane of speech, or he may criticize every animal as being off type or sold too high—but one thing is certain, before he is done he will offer to sell you something a lot better for less money.

It is only necessary to remember that creatures so devoid of common courtesy to those who, at considerable time and expense, have brought out buyers to a sale, would also be found equally wanting in common honesty in their dealings with others. Personally, I have watched this very carefully and have known no exception and those who buy of such specimens generally have cause for regret.

Properly conducted auctions provide the best possible medium of arriving at fair values. They represent a cross section of keen business men putting an appraisal on the relative merits of a breed or breeds or individuals within a breed.

Auctions should be conducted on the same plane and with the same business attitude as private sales are negotiated. Auctions are not, or rather should not be, conducted as a place to match wits, crack jokes or "pull a fast one." They deserve a higher rating and it is very refreshing to know that that type of sale is almost a thing of the past. There is still room for improvement in some of our sales. Most of them are conducted on a high plane of business integrity and it may not be many years until the surplus purebred sheep of this country will practically all be sold at auction sales. This has happened in other leading sheep countries of the world and conditions in the United States are ideal for its development.

Artificial (Machine) Drying of Roughage

Condensed from Hoard's Dairyman

S. R. Winters

MORE and more, dairymen are realizing not only the need for good quality in fodder crops but that proper method of harvesting, cutting, and storing the fodder is important. In the latter case, experiments of several years' duration have proved that the foremost essential in preventing spoilage in stored crops and the preservation of nutritive elements is to force the air out promptly and to keep it out.

It should be borne in mind that the palatability and food value of fodder depend upon the raw material composing it. Tender young grasses are far preferable to older and mature growth. They are also much lower in fiber content. Grass hays should be cut not later than at the early bloom stage, and preferably before blooming if the high protein content is maintained. Weeds are never palatable.

The commercial forage-drying machine makes possible the utilization of large amounts of forage while still in its immature stage. Forage so preserved, still holding its high protein, vitamin, and mineral content, will by itself or in combination with silage and hay, make a complete diet for dairy cows during winter months, as does fresh pasture grass during the summer. But the many advantages of machine drying, however, must be balanced against the expense of the machine, particularly in the case of the small-scale dairyman.

The cost and upkeep of harvesting machinery is no little item of expense. The Bureau of Dairy Industry, U. S. Department of Agriculture, at its Lewisburg, Tennessee, experiment station, found the total cost of machine drying, or dehydrating as it is called, 171 tons hay amounted to $11.77 per ton of dry hay. This included the harvesting and storing of hay and $3.20 for repairs. The interest or depreciation of the equipment is not included.

Most machinery intended for the handling of dry hay is not strong enough for the handling of heavier green fodder.

Data on the variance of time and fuel required in handling different hay crops show that grain sorghum and corn, because of the pith in the stalk, are difficult to handle and 46 gallons of fuel oil to the ton of dry sorghum were

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required. The rate of drying was 1,201 lbs. per hour. Lespedeza hay, which contains only about half as much moisture as sorghum, required but 13.3 gallons of fuel oil per ton, with a drying rate of 2,352 lbs. per hour. The rate of soybean drying, which fodder contains only about seven per cent less moisture than sorghum, was somewhere in between that of the two crops named, being about on the same level with alfalfa. Less than five minutes is required for the hay in the machine to be properly dried. Most roughages hold an average content of 60 per cent moisture when green, but machine drying reduces this to about 12 per cent.

The Bureau of Dairy Industry has been co-operating with the Western Washington Experiment Station and the Washington Agricultural Experiment Station in making careful studies of artificially dried pasture herbage, its nutritive qualities, and general food values. This pasture herbage of grasses and clover was cut at two or three week intervals and, therefore, contained a high protein content. Experiments in feeding it to a herd of two-year old heifers found that a 15-pound-per-day-per-heifer ration was not only sufficiently nutritious for their maintenance but it also added weight to the animals. An 18 per cent digestible crude protein content and a total digestible nutrient content of 65 per cent was contained in the herbage, thus making it comparable to many high protein concentrate feeds.

In the feeding trials conducted with milking cows, dried grass was substituted for part of the regular grain mixture. In addition to silage and alfalfa hay, a grain and grass mixture contained 20 per cent of artificially dried grass. The cows so fed produced a little less milk on this ration than when they were fed a similar ration in which linseed meal and wheat bran were substituted for the dried grass and grain feed and its total digestible nutrients stood in favor of the mixture which, though rather bulky, was palatable and readily eaten.

This experiment indicates that artificially dried grass may be substituted for fully 20 per cent of the protein-rich concentrated mixture.

Another experiment, conducted with two cows, entailed their maintenance on artificially-dried grass and alfalfa hay for four weeks, then switching them over to a straight alfalfa ration. Two other cows were dealt with exactly opposite, being fed with alfalfa first, then machine-dried grass and alfalfa. Adding the dried grass to the straight alfalfa increasing the consumption of total digestible nutrients which, in

turn, increased the gain in live weight and a larger output of milk and butter fat.

One of the most important elements in green fodder is carotene. It is particularly abundant in carrots as well. This is one reason why carrots are so valuable to the stock grower. Carotene is the source of color in butterfat and while richly colored butter is desirable from the economic standpoint, the carotene content is also the material which goes to produce the much talked of Vitamin A. This fact, of course, makes the preservation of carotene in the feed doubly important, because the element is so valuable to the health of the animal consuming it and because it is so necessary to the health of the people who benefit from it through the medium of dairy products consumed. Following droughts, when the pasture lands have become dry for a good portion of the summer and the hay is consequently poor in quality, the lack of carotene causes the cows not only to drop in milk production but also to fail in delivering their calves normally.

To preserve a good color and high carotene content, moisture in hay must be reduced quickly and without undue exposure to dew, rain, or sun after cutting. With the forage-drying machine, grass may be harvested and dried whenever it is at the proper stage for cutting, without regard for the weather.

The speeding up of artificial drying, in order to get the most out of the fuel used, lowers the nutritive value of the fodder. In tests conducted, exhaust-gas temperatures varying from 250 degress, 300 degrees, to 350 degress F. proved that the chemical composition of the grasses did not change, but when a 400 degrees F. was reached, the crude fibre content was increased with some burning of the more leafy material, and a greatly reduced digestibility and reduction of calcium, or bone-making material.

Agriculturists experimenting with the vitamin D content of dehydrated pasture grass as against that of green or sun-cured grass, decided that either the artificially dried grass or the sun-cured grass was as efficient in calcification (or Vitamin D) as grass cured by a fifteen-hour exposure to sunlight.

History of Farm Implements

Condensed from Missouri Ruralist

Cordell Tindall

ALTHO most modern implements, as we now know them, have been perfected in the last 100 years, the principles used in these machines were discovered, one by one, over a period of many centuries.

Primitive peoples naturally used primitive farming implements. In the stone age crude hand tools of stone were developed. A number of tools used in this period have ben found, including hammers, chisels, planers, awls, knives, scrapers, borers and axes. Some of these were chipped from stone, others polished, and crude handles of wood, bone or horn attached. Our Indians knew and made many of these tools and they can be found in some of our fields today.

As all primitive people were farmers, they naturally developed a few tools to help them in their work. At first they lived off the land and made no effort to sow and reap. But hard times convinced them that perhaps it was better to establish a home and try to grow something to tide them over the lean periods, such as the winter months. In the Old World they planted the small grain cereals, such as wheat; in the New World it was maize, or corn as we now know it.

At first a digging stick was used to work the soil. Sometimes it was weighed down by a stone. Then a crude hoe was devised made of a forked branch, then later it was equipped with a blade of stone or bone.

We must keep in mind the difference between a plow and a hoe. A hoe is used with a chopping motion only, while a plow is pulled thru the ground to make a continuous furrow. Just when the plow appeared is not known. It was a sharpened forked branch. It probably was pulled first by man power, altho the use of oxen and horses dates back to prehistoric times.

The oldest known representation of a plow is on an old Babylonian seal impress at the Pennsylvania University Museum. One man is shown seeding a tube, or grain drill, thru which the seed was dropped into the furrow.

The Egyptions made good use of the plow. They used animals to pull it, but as human labor was cheap, they sometimes hitched as many as a dozen men to one

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plow. In Korea a 3-man plow and spade with 2 ropes is used today. In far-away places primitive plows still are in use.

Just as there is a big difference in a hoe and a plow, so there was a difference in the people who developed the two implements. We might say that in the beginning of time there grew up both a hoe culture and a plow culture, two civilizations based on the use of these two farm implements. The plow culture was that of the Old World, and was closely connected with the use of small grains and draft animals. In the New World, the hoe was used to cultivate maize and there were no draft animals, for it must be remembered that there were no horses in America until the white man came.

We must consider the combination of wheat, the plow, the oxen and horse, and the cart. All of these things may not have originated at the same time but they appeared together in early Egyptian and Babylonian culture.

But corn growers can point with pride to the civilization based on maize in Central and South America, and even our Indians were pretty good corn farmers. But because corn needed only a crude hoe to cultivate it no farm implements were invented, so we must turn back to the Old World to continue our history.

We mentioned the cart in connection with the culture of the Old World. To have a cart one must have at least two wheels. The wheel may be said to be the greatest of all inventions. And like so many other fundamentals of farm machinery, its first use is only a guess.

Man at first carried all his burdens on his own back. But the weak or the lazy discovered that animals could carry their burdens. The animals on hand, including the horse and the ox, were used for food and sacrificial purposes. The American Indian, having no horse, used dogs as his first beast of burden. Over the world there are a lot of pack animals, donkeys, cattle, camels, and the llamas, of the New World, a cousin of the camel.

The next step was the discovery that the horse could drag more than it could carry, thus saving many trips. The sled is a familiar example of this. Also the two poles drawn by the horses of the Indians, called "travoises."

The next step in transportation was the wheel. The very first wheel, it is thought, was a log, used as a roller to move heavy objects. Then a brilliant mind put pegs on each side of the roller to hold them under the burden so that it would not be necessary to pick the roller up behind and put it in front again. This worked better but still there was a lot of

friction. So the middle section was cut away making a crude axle. In some places in the world we still have this type of wheel turning with the axle. The next step was to cut away part of the wheel to lighten the whole thing, again to make less work. It was a long time before spokes were used. In China today a type of wheel made in an "H" form is in common use.

Just where the wheel was invented is a disputed question. In the civilizations of the New World, the Incas, Mayas or Aztecs, there was no wheel. The Egyptians were fairly late in acquiring it and adopted it long after they knew the plow. The wheel probably was invented only once, somewhere in Southeastern Asia, and its use spread to all the world. Wagon wheels of about 500 B. C. have been dug up at Dejbjerg, in Jutland, and now are in the Copenhagen museum. These were not made of separate short pieces put together, but are turned in a circle out of a single block of wood.

The early agricultural implements mentioned have been for tilling the soil only. As fields became larger and there were more people in the cities to feed, it became necessary to devise quicker means of harvesting crops. In the New World, where corn was king, this was not necessary and corn harvesters are only a recent invention. But in the land of wheat, it was more work. The first sickle to cut grain was made of bone or stone, but in the Bronze Age blades were cast from metal. The familiar new-moon-shape of the hand sickle is centuries old. The Romans put longer handles on their blades and were able to stand up and take a wider swath.

The early Gauls developed a sort of header-reaper pulled by oxen which, according to Roman reports of the implements, was something like our modern reaper. But during the Dark Ages the hand sickle was the common tool. The scythe, which later developed into the cradle which we all know, was used up until the Agricultural Revolution when numerous inventors turned their wits on the problem of reapers.

Threshing also was a problem. Tramping around on a pile of the cut grain with bare feet was one method. Oxen and animals also were used to tramp the grain.

A sort of sled drawn by oxen was another primitive method.

The flail, which we consider pretty primitive, was not known until the Middle Ages. It is not known just when or where it was first used. It consisted, as most of us know, of two pieces hinged together, and was used to beat the grain from the hulls. The chaff was separated from the grain by letting it drop and the

wind, either natural or artificial, blew the chaff away.

Many principles of our farm implements have early histories. For instance, the lever is thought to have been known as early as the stone age. At any rate the Egyptians knew its use and utilized it in building the pyramids. Archimedes, a Greek inventor, credited with numerous inventions, once said to his king, "Give me a place to stand and I will move the earth." Incidentally, this Greek created a device used on every threshing machine to elevate the grain. This spiral device, something like an endless screw, was invented to empty the hold of a ship of water.

The cog wheel, an essential on most of our modern machinery, probably was developed in Egypt. We must give the same country credit for the fly wheel. Early rope makers used it to keep their rope rotating continuously. The Egyptian flywheel also is found in the Orient, where it is used to keep in rotation the little prayer drums in the hands of the faithful. Balance scales were another Egyptian invention.

Most interesting is an early use of the ball bearing principle. Remains of an old ship have been dug up in Lake Nemi, in Italy, which had a ball bearing apparatus revolving a pavilion to keep the commander of the ship in the shade.

The Story of Yorkwin Wheat

Condensed from American Agriculturist

H. H. Love

New York State College of Agriculture

SOME may think that Yorkwin wheat just happened, but this is not the case. The Yorkwin has been developed through the methods of plant breeding or plant improvement. In this practice we deal with the nature or heredity of plants. Plants possess many different characters, some good and some bad, that are inherited or passed on from generation to generation. In improving plants it becomes necessary to sort out those having several good characters and then cross such plants in the hope of producing a new type that will inherit some, if not all, of the good characters of the plants chosen for crossing. In following this method it is necessary to make a large number of crosses involving many different types or varieties, for not all crosses lead to a successful result. Some will, however, and it is the task of the plant breeder to make crosses on a large scale so he may find those combinations that will give satisfactory results.

Among the many types and varieties of wheat that were being tested at the Cornell University Agricultural Experiment Station, there were two sorts that possessed a number of good characters. One of these was the Gold Coin, the variety from which Junior No. 6 was developed. This variety had a good stiff straw, was highly resistant to loose smut, stood the cold New York winters rather well, and possessed a good white kernel. While it yielded well, it was felt that this yield could be improved. The other sort was a selection from the variety known as Dietz. This strain yielded rather well but did not have a very stiff straw so that it tended to lodge, especially in some unfavorable years. The color of the kernel was red and the heads were heavily awned, or bearded. Since the demand in New York State is for a good white wheat, it was desirable to eliminate the red color of kernel. The beards also were undesirable.

These two sorts, Gold Coin and the selection from the Dietz variety, were crossed, and the first result gave plants that were not like either parent but were

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more or less intermediate between the two. These plants were hybrid in nature and would not breed true, so the seed from them produced many different types of plants. Some were like the parents and some were different from either, giving really new forms. Many of these new forms were selected and planted another year to determine which ones would breed true or, as we say, were fixed. This means that they will continue to produce only one type of plant and this takes another year or two before we are certain that the new type is constant for all the characters. After it has been determined that the types will breed true, it is then necessary to compare them with the commercial varieties commonly grown to see whether they will produce more grain to the acre and will stand up well and survive the severe winters.

Of the large number of new forms selected from this cross, there was one that seemed to be especially good. It had a good white kernel of large size, possessed a good straw and was winter hardy and, while not smut resistant, did not smut readily. One special characteristic of the new type was the long head, which we know is a desirable feature, especially if there is anything in it. In this case there is, for the head is well filled with kernels. This new type, the Yorkwin wheat, has the ability to yield better than either of its parents. In fact it yields 13 per cent more than one of the parents and 23 per cent more than the other. This yielding ability is proving itself, as is shown by the fine reports that have come in this year. One field yielded at the rate of 64 bushels to the acre; another making 61 bushels to the acre. It is recognized that this is a good wheat year but in average years this variety will still give a good account of itself. This is evident from the following comparisons, which are the average yields for eight years obtained at Ithaca, New York:

Yorkwin ..... 39.7 Bu. per acre
Valprize ..... 35.2 Bu. per acre
Forward ..... 35.0 Bu. per acre
Honor ..... 33.0 Bu. per acre
Junior No. 6 .. 31.9 Bu. per acre

It is evident that the Yorkwin has inherited those characters that enable it to produce well.

When observing the Yorkwin wheat, or any other produced in a similar manner, it is well to remember that the production of such types requires considerable time and much experimenting. From the time that the first cross was made until we were sure the new wheat was good enough to introduce, many years had elapsed, during which time there were numerous tests and comparisons made to determine the worth of the Yorkwin.

Farmers' Co-operatives . . . New Model

Condensed from Farm and Ranch

C. E. Bowles

Extension Specialist in Co-operative Marketing, Texas A. and M. College

THERE is evidence on every side that a new order has come about in the field of co-operative marketing. The old co-operative pattern, dominated by ambitious and spectacular plans for handling farm commodities over a dozen or more States, is being replaced by a new design.

The new model co-operative is local in its scope and performs some needed services for its members, such as grading, packing, ginning, processing, assembling, storing, distributing and marketing. The typical co-operative of 1938 has an avearage of less than 200 members and serves a comparatively small area, usually a single community. Its principle function is to increase the market value of the products of its members, thereby securing for them a larger share of the price finally paid by the consumer.

Still under the influence of the thinking of ten and fifteen years ago, the Federal Farm Board turned to co-operatives as a means of stabilizing farm prices. National co-operatives were encouraged for handling the more important commodities such as cotton, livestock, grain, wool, and vegetables. These gaint organizations usually had subsidiaries in the States and regions in an effort to get closer to the producers. Speaking broadly, the rank and file of farmers did not develop any feeling that these far-flung marketing machines belonged to them. Often, they "sold the co-op" their wool, cotton, grain or other produce as long as the advances offered were above prices being paid by private traders. The entire system was complicated by attempts of the Farm Board to stimulate prices by loans, frequently above current prices. These National associations served as machinery for accumulating large stocks of commodities for the Farm Board, some of which were handled at heavy losses. Farmers generally had invested nothing in these co-operatives and consequently did not take that interest in them which naturally accompanies ownership.

Where many of the co-operatives of the old order started from the top and attempted to grow

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down to the communities and farms of the Nation, the new model has taken root in the very soil of the country and gives promise of growing up.

The citrus growers of the Lower Rio Grande Valley started with local packing associations set up by growers to correct some practices which had grown up in the industry and which sometimes left the grower nothing for his fruit. These local associations were successful in cutting packing and handling costs in half and returned this saving to their members. The local associations soon found problems which were too big to be solved by small groups of growers and, out of this need, in 1932, grew the Rio Grande Valley Citrus Exchange, a federation of the local co-operatives. The Exchange handles sales for the member groups and makes possible a number of services which the local associations could not receive without the federation. An outstanding service is the processing of surplus grapefruit into canned juice and dehydrated peel and pulp. The citrus growers know that they own and control both the local associations and the Exchange because they have invested heavily of their own capital in these enterprises and they elect the growers who direct their organizations.

Co-operative cotton gins, 1938 model, have also grown from the "bottom up." Early attempts at co-operative cotton ginning, going back as far as fifty years ago, were made under the general corporation laws.

If they succeeded financially, they failed as co-operatives, for in most cases, the stock was acquired by individulas or by very small groups after which the gins were operated for the benefit of invested capital and not in the interest of the cotton growers. Then there was the entry of the Texas Cotton Co-operative Association into the ginning business. During the period 1924 to 1933 this organization built and operated thirty-eight gins in various sections of Texas. They were centrally controlled and were operated more to secure cotton and seed for the association than to furnish ginning at cost to the growers. This venture was generally unsatisfactory and all of the gins have since been bought by local associations of farmers.

There are now aproximately 300 co-operative gins in Texas, each owned by a group of farmers. The number of members in these associations varies from 20 to 700. These stockholders put their own money and savings into the gins in order to secure good ginning service at cost. The members elect directors, the directors choose a manager and the manager runs the gin as

long as he does so to the satisfaction of the membership.

As was the case with the local citrus associations, the co-operative gins are finding that they have problems which extend beyond their communities. Several groups of gins have federated into district co-operative associations of twenty to thirty gins. These federated groups can gain some advantages in the purchasing of supplies and in the marketing or processing of cottonseed. One of the handicaps to past and existing systems for the co-operative marketing of cotton has been the lack of strong local associations of cotton growers through which cotton can be easily and economically assembled. It is possible that the co-operative gin associations and district federations of gins may in time serve to assemble and block their members' cotton for efficient marketing.

Wheat growers of northwest Texas are organized around forty-eight local co-operative grain elevators which, in turn, have federated to form the Producers' Grain Corporation. Terminal facilities, market service and other assistance are provided by the central organization. Democratic control of the co-operative marketing machinery for wheat begins with the wheat growers who elect directors of the local elevator associations and also district directors for the board managing the affairs of the Producers' Grain Corporation.

More than sixty local farmers' purchasing associations scattered principally in northwest Texas federated to provide themselves with wholesale facilities, the Consumers' Co-operatives Associated. Each local is a complete self-governing unit, serving its members by securing for them supplies needed in the production of agricultural products. The locals own the stock of the wholesale purchasing association and control it in a democratic manner.

The trend over the entire field of co-operative marketing in Texas seems to be definitely away from the big centralized organizations and toward strong associations of neighbors, each group retaining the maximum of independence and local control. These grower-owned co-operatives perform those services which they can do efficiently and, as need arises, the local associations federate to provide still larger services for their members.

Anthrax

Condensed from Pacific Rural Press

THE history of anthrax," according to D. H. Udall, Professor of Veterinary Medicine at Cornell University, "is marked by three events of great importance: first, it was one of the first scourges to be described in ancient and Biblical literature; secondly, when Pasteur immunized animals against anthrax in 1881, this classical demonstration was the first example of artificial immunization against disease by means of an attenuated culture of the specific cause of that disease; his work with the anthrax bacillus established the foundation of all subsequent development in immunity; and third, the anthrax bacillus was the first specific cause of disease to be described.

"Anthrax is general throughout the world, especially in Russia, Asia, Africa, and the tropics and all warm climates. Heavy losses from the disease have occured in the lower Mississippi valley and southern California. In many localities, known as 'anthrax districts,' enzootics are frequent and few states in this country are premanently free from such outbreaks. It affects chiefly cattle, sheep, and horses; less often swine, dogs, cats, and chickens. It is sporadic in man as a local infection of the skin, the lungs, or the intestines. In the United States there was an average of 33 deaths a year in people from 1911 to 1920 in the registration area. Recovered animals are permanently immune.

"Modes of infection are: (a) Soil infection—Once the soil becomes infected it remains so for years. New invasions result from inundation of pastures with tannery refuse, from improper disposal of anthrax cadavers, and from flesh-eating animals and birds that carry the germs in the feces or upon the feet. Pasteur, finding spores on the surface of the ground where an anthrax cadaver had been buried, thought the earthworm brought bacilli to the surface. Spores are not found in the buried carcass and the bacillus is soon destroyed by decomposition of the tissues, so that their presence at the surface is probably explained by contamination before burial.

"(b) Ingestion—Cattle and sheep usually contract the disease from infected pastures and streams. Roughage and grain may also carry the virus and occasionally cause a sporadic stable infection. Swine, dogs, cats, and chickens sicken after eating anthrax cadavers, licking infected

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560 Howard St., San Francisco, Cal.

blood and hides, or any object that has recently been contaminated.

"(c) Biting insects—Horses are often inoculated in the skin from blood-sucking flies and mosquitoes, and cattle are likewise exposed. This form of infection is located on the thin-skinned ventral parts of the body and neck—sheath, mammary, glands, flanks and throat—where it causes necrosis of the skin and inflammatory edema. Nowodoff, with a view of testing whether horses can be infected with anthrax by paths other than the skin, injected a large dose of culture into the vein of an 18-months-old colt without results.

"(d) Wound infection—Contaminated hands and instruments may inoculate an operative wound in animals. Man is usually infected through wounds. In Great Britain 80 per cent of the anthrax in man is due to handling hides at the docks and tanneries; Chinese and East Indian goods are the chief source.

"(e) Inhalation—This method of infection is known to occur only in man—wool sorter's disease or pulmonary anthrax.

"While these are the usual methods of infection for each species, it is probable that exceptions are frequent. Opinions differ in regard to the relative frequency of ingestion and inoculation anthrax.

"Sudden deaths in pastured stock may be caused by other acute infections—blackleg, hemorrhagic septicemia, by lightning stroke, and by lead or other poisoning. Cattle not infrequently die at pasture, especially in the spring, without a diagnosis being made even when the cases are thoroughly investigated. Recognition depends largely on finding the bacillus in the blood of the sick or the tissues of the fresh cadaver. Because of the importance of making an early diagnosis, smears from the blood before death are preferable. In no other disease are similar bacteria found in the circulating blood. If doubt exists, a mouse or a guinea pig should be inoculated. Any acute, undiagnosed, febrile disease occuring in the summer suggests anthrax. Edematous noncrepitating swellings are highly suggestive. Autopsy lesions of special significance are: failure of rigor mortis, bloody foam at the body openings, hemorrhages throughout the body, and *enlargement of the spleen.*

"For laboratory diagnosis send fresh iced blood, heart, spleen, or liver. A negative report is not always conclusive, for the bacilli die rapidly in putrefactive tissues and they may succumb in transit.

"To prevent soil contamination, all cadavers should be deeply buried or burned without cutting the skin, and material that

drops from the body openings or that has been in contact with virus should be destroyed by disinfection or burning. Suspected hides or animal products require thorough disinfection for the protection of both men and animals. As far as possible, the sick should be segregated and the well removed to a different pasture. Take the temperature of all animals night and morning where the disease exists and make a diagnosis of anthrax in all that have a fever.

"Treatment: Anti-anthrax serum has proved to be successful in the treatment of anthrax in both animals and men. It is the sole remedy. The dose is 100 cc., preferably in the vein. According to Derflinger, an initial dose of 250 cc. is more effective."

Poultry Litter

MANY farmers use ground corncobs or straw. Altho straw almost always is available and requires only the labor of carrying it in, it is not very satisfactory. Those who use straw find that they must clean their laying house at least once every 7 to 10 days during the winter months in order to keep the house dry.

On the other hand, with some of the newer litters such as peat, processed sugar-cane fiber, or processed cottonseed hulls (as well as shavings), litter removal is required much less frequently. Shavings ordinarily last a month to 6 weeks, and the other materials need to be changed only once or twice a year. Consequently, when the cost of the labor required to change straw so frequently is considered, these other litter materials are found to be much more satisfactory.

—*Successful Farming*

Made-to-Order Corn

Condensed from The Nebraska Farmer

Carlyle Hodgkin

WHEN the White Man first came to live in America he found corn very much like the common corns we grow today, ears uniform and fairly large, kernels distinctly dented. Merle T. Jenkins, chief corn breeder for the U. S. Department of Agriculture, wrote these interesting lines: "Of all the things that are characteristic of America, corn is perhaps the most characteristic. The discovery of America was the discovery of corn. There was a corn civilization in this country before the coming of Columbus, especially among the Aztecs, the Mayas, and the Incas, and in a very real sense there still is a corn civilization. . . . Today corn is the backbone of American agriculture. The United States, principal corn-producing country, grows three-fourths of the world's supply. . . ."

The White Men straightway began to try to make improvement on what the Indians had done. At first they continued the common method that is still common today—mass selection. They simply picked out and planted the best-looking ears. One of our well-known varieties, Reid's Yellow Dent, was developed by that method. Robert Reid moved from southern Ohio to central Illinois in 1864, taking along his late-maturing corn called "Gordon Hopkins corn." The first year it made a fair crop of immature corn. But the next year it did not germinate well, and so he filled in the blank spaces with a local early-maturing variety called "Little Yellow Corn." There naturally was cross-pollination in the field and Mr. Reid picked out the best ears. His son, James L., after many years of careful selection, developed Reid's Yellow Dent from this beginning.

For a while they used the ear-to-row method whereby part or all of the kernels from one ear are planted in one row. This was introduced by C. H. Hopkins of the Illinois Agricultural Experiment Station in 1897. The idea was that a variety could be developed from the seed ear that did the best. But there was an obvious difficulty with this method: because of the normal cross-pollination of corn the kernels on an ear, though they all had

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the same female parent, might have many different male parents. Their inheritance thus would differ greatly. Ear-to-row selection, though it was widely practiced for a time, was on the whole a disappointing procedure.

W. J. Beal, botany professor at Michigan, is the first man known to produce a hybrid. He began experimenting with corn in 1870. By 1876 he was ready to predict that the way to real corn improvement would be through the practice of pollen selection (which is what you do when you hybridize). In 1878 he began crossing varieties, carrying on what probably was the first detasseling in history. He was the first man to cross corn varieties for the sole purpose of getting the "vigor" of the first hybrid generation.

In Mr. Beal's experiments, however, he was simply crossing varieties. The big step forward, the thing that made corn breeding really begin to click, came when two other fellows began to work on the idea of crossing inbreds. They were George H. Shull, working at Cold Spring Harbor, Long Island, and E. M. East, at New Haven, Connecticut. Experiments in 1908 and 1909 marked the beginning of a new era. They showed that three things are possible: (1) the development of inbred lines that breed true for certain characteristics; (2) the determination of particular inbred lines that are more productive in crosses; and (3) the use of superior crosses in the commercial production of hybrid corn.

From that time on, hybrid corn research went into high, centering naturally in the Middle West where most of the nation's corn is grown. Henry A. Wallace, the present secretary of agriculture, was one of the early private hybridizers. Mr. E. D. Funk, of Illinois, in 1916, made the first shipment of commercial hybrid seed corn. At the Nebraska Experiment Station Mr. E. G. Montgomery began inbreeding and hybridizing experiments in 1909.

Hybrid corn has now become the most important agricultural fact of this century. Fifteen million acres are planted to hybrid in the United States this year. Farmers who 10 years ago had never heard of hybrid corn are now "trying it out." In 10 more years it will be as familiar to them as the chickens in their farmyards.

Corn normally "cross-pollinates." Each silk on the ear must receive a pollen grain in order for the kernel to develop. The silks are out in the open and, at the proper time, pollen is flying everywhere. Thus it is plain that the kernels on one ear, all having the same female parent, may

have as many male parents as there are kernels. This random cross-pollination is the condition you have normally in a field of ordinary corn.

But corn, cross-pollinating normally, can be self-pollinated artifically. That is the basis of hybrid corn. To get a hybrid you first have to develop two "inbred" lines. To get an inbred line you self-pollinate a corn plant, grow more plants from the kernels it produces and self-pollinate them, and so on for five or six generation. When you have done that you have a "pure line."

Of course when you begin to inbreed you will start not with one parent plant but with many. And you will select the parent plants with certain goals in mind —high yield, uniformity, stiff stalks, smooth ears, deep roots or whatever it may be. After you have started with the inbreeding you will see some funny things happen. The plants in each of the first two or three succeeding generations will get smaller and smaller. Some of them will become barren, wholly unable to produce ears. Others will become weak and spindly and sickly. A few—you hope!—will, even in their dwarfed state, continue to show the qualities that are your goal.

Naturally, as the inbreeding progresses, you will discard the lines in which weaknesses appear. After about five generations the good ones you have left can be called a pure line. By the long process of inbreeding and eliminating you have greatly concentrated the good qualities of the parent plant. Inbreeding for several generations is the severest test that you can give a strain of corn.

As to the actual mechanics of self-pollination, there are two common methods. One is to tie a paper sack securely over the developing tassel and a small glassine bag over the ear shoot. When the silks first appear the glassine bag is removed, the silks and about ¾ inch of the husks cut off, and the bag put back on. In about 24 to 48 hours a brush of fresh silks about 2 inches long will have grown out. Then the pollen is collected in the tassel bag and dusted on the silks. The tassel bag is then put over the shoot and left there until fall. This is called the "tassel bag" method.

The other method, developed by Mr. Jenkins, of the U. S. Department of Agriculture, is called the "bottle" method. He describes it thus: "When the silks appear under the protecting glassine bag, the bag is removed and the shoot trimmed back as in the "tassel bag" method. A 2-ounce bottle of water is hung on the stalk at the ear-bearing node. The tassel is cut from the stalk,

its shank inserted in the bottle, and the tassel and shoot enclosed in a large paper bag. The tassel is arranged directly above the ear shoot. The bottle of water serves to keep the tassel alive while new silks appear, and as fresh silks grow they are pollinated. . . ."

The cross of the two inbred parents is made simply by planting them in adjoining rows under controlled conditions where no foreign pollen can possibly be present, and detasseling the plants of the female parent. The ears produced on the detasseled plants are "single cross" hybrid corn. When the kernels on those ears are used for seed the following year the resulting corn will be something like a miracle. The stalks will rebound to normal size. The yield will be far above the yield of either parent and substantially above the yield of ordinary open-pollinated varieties. The thing that causes the rebound is called "hybrid vigor," or, "heterosis." It is exactly the same thing that gives the mule its great endurance. It comes from the crossing of two wholly unlike parents.

And right we come to the thing that has been a sticker to many persons: *the fact that when you plant hybrid seed corn you can't use the corn it produces for the next year's seed.* In the commercial field you get the normal cross-pollination again. The corn produced is no longer the result of crossing two wholly unlike lines. The "hybrid vigor" is gone. If you use the corn for seed, you will drop back to a much lower yield.

You can easily see that it would be impossible to build a big commercial hybrid corn industry based on single-cross hybrids. It takes too long to produce the inbreds. The inbreds are exceedingly small—stalks, ears and kernels—producing very little seed. A big supply of hybrid seed for commercial corn production could not be produced directly from the inbreds.

But again, very happily, those fellows who changed things found out something. They found out that you can use single-cross hybrids to produce "double-cross" seed just exactly as you use the inbreds to produce single-cross seed. In other words, you can plant two single-cross hybrids side by side and detassel one, and the "double-cross" seed produced on the detasseled row will retain all the hybrid vigor of the single cross. This use of single-cross plants as parents for double-cross hybrid seed makes it possible to produce commercial hybrid seed corn in much greater quantity. It is the basis upon which the commercial hybrid corn industry rests.

Stones Go

Condensed from Farm Journal

R. U. Blasingame

SAID a farmer in southeastern Pennsylvania: "Those stones in my fields are like a millstone around my neck."

No wonder! What he said, thousands of farmers have thought, because for generations farmers of this and other countries have worn out and broken up their plows, harrows, planters, mowers, binders, potato diggers on the same crop of stones. Picking stones from farm land has always been back-breaking work, seldom thoroughly done.

But now we have a stone picker which will pick all the stones from a field—stones as small as an egg, as big as a water bucket. Stones are gathered by a rake and rapidly-revolving picking teeth which sink into the ground about three inches.

The teeth clear the rake and throw the stones into a hopper with an A-shaped bottom. The hopper is emptied from both sides by merely pulling a lever. A roller in the rear of the machine firms the ground over which the picker passes.

During recent tests at Pennsylvania State College, the machine picked stones from a field at the rate of about 12 tons an hour. The hopper (it holds two tons) was filled in about four minutes. The distance of travel for a load was nearly 600 feet.

Picking teeth are provided with release springs so that when too-large a stone is encountered, the picker passes over without damage. A two-plow tractor handles the stone picker with ease, driving the picking mechanism through the power take-off.

This machine begs for a chance to do its stuff, say, in the Maine potato growing areas where stone-bruised potatoes are a source of loss. A recent report of investigations there shows that average bruising "range from 9.34% when there were less than 150 stones per 100 pounds of tubers to 24.26% for 450 stones or over.

"In other words, there was less than half as much bruising in the group with few stones as in the group with many stones. Major bruising for less than 150 stones and for 450 stones or over was .67% and 2.58% respectively, and corresponding minor brusing was 8.67% and 21.68%."

For best results, this new

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mechanical picker asks only that the land be plowed and harrowed. This gives the teeth a better chance to penetrate the soil, and makes less power necessary for operating the outfit.

Besides picking stones, the teeth break all clods and spray the soil through the rake, so that it settles down finely pulverized and firmed by the roller.

Who will predict that this new machine, besides clearing fields of stones, will stimulate interest in the use of stone for roads, foundations, floors, etc.?

Inefficient Landlords

Condensed from Successful Farming

IF we want to do something about tenancy, why not improve landlord management? The way some landlords manage their farms is a sore point in the tenancy situation.

Of course, not all landlords are inefficient. The point is, too many of them are. Among them are individuals left with a farm in place of a mortgage, estates with land but no heir wanting to take it over, and investors in farms with no thought save that of the profit to be realized in the sale. Tenants on farms owned by landlords of this type are severely handicapped.

A firsthand view of this problem is provided by the recent discussions of 28 county agricultural conservation committees in Iowa reported by Rainer Schickele and Charles A. Norman of the Iowa Agricultural Experiment Station. Concerning business and professional men as landlords, this report says: "In this group are some of the best and some of the poorest landlords. In general, the farther away from the farm they live, the less efficiently they perform their functions as landlords." This group was estimated as owning 14 percent of the tenant farms in the state. About another group —widows and estates—the report states: "Widows rarely are efficient landlords, and estate farms operated by non-related tenants who have no interest in the family estate are often very poorly managed."

But why pick on the landlord? At least, you say, why not include the incapable tenant? Altho there is merit in the suggestion, a diagnosis of the tenant's ills is another story. The landlord should come first because he is in control of the land. As master of the situation, he chooses the tenant, the type of lease, and

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writes into the lease the specifications on how the farm is to be operated. All this and much more calls for a landlord with farm-management ability. Unfortunately, the lack of this very ability is all too common among landlords. And consequently land, tenant, and landlord suffer.

Some will consider this ability in farm management an unnecessary qualification of farm ownership. Many a landlord may ask, "What problems of management do I have to face that require all this training and experience? As I see it, all I have to do is lease the farm, collect the rent, and pay the taxes."

But what kind of lease are you going to have—a cash, crop-share, or stock-share lease—and if you are charging cash rent for pasture, how much are you asking? The answer to this seems easy. You say, "Whatever lease and charges are common in the community." Provided all farms are alike in your locality, this solution might work. No two farms, however, even in the same neighborhood, are sufficiently similar to warrant the same lease provisions. In any event, a careful appraisal would be necessary to make sure that any two farms did call for the same lease arrangements.

"My farm yields at least 10 percent more than the county average, and the lease calls for cash rent 10 percent above the county average, but my tenant thinks the rent is too high," a landlord complained to me not long ago.

"Are you sure your farm is 10 percent more productive than the average farm in the county?" I asked.

In the discussion that followed, this landlord made it clear that he was positive of his claim. However, since he lacked any definite yield figures for the county or for his farm, he failed to convince me of his point.

This suggests another task landlords are called upon occasionally to perform: selecting a new tenant. Suppose you, a landlord, wake up one fine morning to find that your tenant has bought a neighboring farm and is leaving your place in March. How are you going to obtain a new tenant? Some tenants may be better suited to your farm than others; particularly if your farm is adapted to a certain type of farming, is unusually large or small, or has other distinguishing characteristics.

Let's ask the landlord some more questions: "What do you know about the soil on your farm?" "What crops are best adapted to it?" "What fertilizer applications, if any, are justified? And if justified, under what set of price conditions?" "Do you leave the question of rotation and

crop for each field to the tenant?" You might do this, of course, if your tenant has a cash lease, but few have; much more common is the share lease with the crop program a mutual responsibility of landlord and tenant.

Even tho the landlord is thoroly sold on maintaining soil fertility, this by itself does not solve the soil-management problem. For example, the application of lime to correct acidity is, on many farms, a question to be decided after testing the soil.

If you have the soil program under control, what about seeding down a field to grass or hay? And if you decide in favor of this, how many acres, which field, what kind of seed, what provision in the lease have you made for such a project, and what will you do if the seeding fails to catch? Or, suppose you try a relatively new crop, soybeans. What division of the crop are you making with the tenant, there being no comfortable, well-established community practice?

Are you sure your farm is not suffering from excessive erosion? Are you familiar with the proper cropping systems for various slopes of different soil types? Some years ago I received a letter from a California landlord who managed his Cornbelt farm by remote control (correspondence). This landlord, entirely ignorant of the true situation, was inquiring why the income from his farm had dwindled during the years, 1922-28, years of stable if not increasing prices. He wondered whether the tenant was slipping. However, it was not so much the tenant slipping as the soil. This farm, like many another under similar management, was slowly but surely depreciating because of plant-food loss followed by erosion. In short, the cropping system was too heavy. Each year this landlord had been receiving, quite unconsciously, a portion of the sale price of his farm mixed in with his rent.

On one particular farm an old barn had finally collapsed, making the erection of a new one a pressing duty of the landlord. The landlord, however, with no background in farming was undecided on the type of barn to build. Finally, not knowing whether dairy or stock cattle were better suited to his farm, he compromised on a general-purpose barn providing for a small number of both. As a matter of fact, the choice was a bad one, a good dairy barn being the logical building, and one that would have attracted the right type of tenant.

But, you ask, if landlord management is as important as these arguments indicate, why haven't we heard all this before? What difference can there be between

conditions now and those 50 years ago? As it happens, there is all the difference in the world. The pioneer extractive stage is gone, farming is keenly competitive; erosion, kinds of seed, types of farming, adjustment programs, and the like are far more significant than formerly. To answer the questions they present requires time and training.

A business or professional man may be hesitating between investing in Government bonds, insurance, or a farm. If he buys bonds, his management consists solely in providing a safe place for the securities and remembering to clip the interest coupons as they mature. With insurance, even less attention may be required. With a farm, on the other hand, management of an exacting technical character cannot be avoided by the owner unless he hires someone to take it over. And where the landlord fails or is unable to provide intelligent supervision, there is something wrong with tenancy.

Landlord management needs to be recognized as the difficult and important task it really is.

Hay

PLACING hay in the windrow with a side-delivery rake when it is about one-fourth cured, and then hauling it to the barn as soon as it is dried sufficiently so it will not heat excessively, is the best method of curing it. This is the conclusion at Iowa State College after 4 years of experimenting with 13 different methods of hay-making in Midwest fields.

—*Successful Farming*

Why Some Calves Die Young

Condensed from The Ayrshire Digest

C. T. Conklin

THE average dairy-bred calf arrives in this world facing a most discouraging economic situation, in which the prospects of his enjoying even a few weeks of life are rather limited. No other farm animal begins its career against such odds; the young of the mare, the beef cow, the sow and the ewe have priority rights to suckle their dams—but not the dairy-bred calf. Man has elected that most of the milk of the dairy cow shall be diverted to other purposes, and as a consequence, the dairy-bred calf must compete from birth with commercial and human interests, most of which are able to outbid him.

Of course, exceptions to this rule are those well-bred calves from ancestors of proven ability; these are expected to grow into breeders and producers of such value as to warrant giving them opportunities to properly develop. In the case of most calves whose dams are kept for butterfat or cream production, man compromises, selling these products and giving the calves the skim-milk, which although quite satisfactory as a feed, has a relatively low market value. To the millions of skim-milk fed calves, this plan is quite favorable, for their competitors are usually only the hogs and poultry that are raised on the same farm.

On the other hand, living conditions are not so bright to those average calves born to cows whose product is sold as fluid or market milk. The normal dairy calf daily requires about ten lbs. of milk per 100 lbs. liveweight, and on this simple economic point hinges his fate. With milk selling at ten cent per quart, a businesslike dairyman is not going to feed a calf five quarts per day at a daily gross cost of fifty cents, unless his calf gives every indication of developing into an animal of considerable merit. Even the farmer getting $1.50 per hundred for milk knows from experience that he can hardly afford to feed very much milk, except to calves that are bred to pay out. Of course there are always the alternatives of underfeeding or of feeding milk substitutes. Although the latter are now quite efficient, their cost is still enough of an item, representing a cash outlay, which too

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frequently prompts many a farmer to half-feed or kill his calves, rather than to raise them.

Because of this combination of circumstances, it is not uncommon for dairymen selling the product of their herds on the higher retail markets to kill their bull calves (and in some instances the heifers from average cows) at birth. Strange as it may seem, the better the milk market, the fewer are the opportunities for the calf to get much, if any, of his mother's milk. The higher priced milk on these farms may justify paying higher prices for cows, but high milk prices may almost preclude raising even enough calves for replacements.

Contrast this situation with that found in other classes of stock, in which a higher market level stimulates the better care and development of the young. No wonder that about 10,000,000 calves are slaughtered annually, with a substantial proportion of these marketed when just a few days of age, and after having consumed little or no good milk. These very young calves may not make very palatable veal, but their carcasses will find their way into the cheaper retail outlets or into tasty canned products of the packing industry.

Dairymen who know their costs of operations have learned from experience that the average calf from ordinary parentage may be more of a liability than an asset, and that it may be the owner's immediate economic advantage to kill these calves at birth, or to sell them for a few dollars when a few days old. Of course, the calf that will make a profitable cow is still worth giving the best of practical care, for good cows are still in the minority.

To Veal or Not to Veal

The fattening of calves for veal has about the same underlying economic principles that govern the raising of calves for dairy purposes, except that good veal depends to a very marked extent on the amount of whole milk that is fed. Allowing calves to nurse their dams, or fattening several calves on one cow reduces the costs and usually results in a better product, but this system is seldom if ever followed on the intensive dairy farm.

The results of several experiments show that it requires ten lbs. of milk to produce a lb. of gain. At first glance, it might seem that with veal calves selling at, say 8 cents a lb., a veal feeder could only break even with milk selling as low as 80 cents per 100. But, let's not overlook the fact that in addition to making a lb. of gain, each ten lbs. of milk is helping to improve the palatability and market value of the calf's original birth weight, which is one of the important

points in the economics of veal feeding.

The best grade of veal calves usually weigh from 140 to 160 lbs., or even more, so let us assume that a fat calf, weighing 160 lbs. at six or eight weeks, is the feeder's objective. Quite obviously, if the birth weight of the calf is 90 lbs., then 70 lbs. of gain would be required, necessitating the use of about 700 lbs. of milk. But, should the birth weight of the calf be only 60 lbs., then 1,000 lbs. of milk would be required. It will be seen that birth weights, market weights, milk costs and veal prices all contribute to the profits and losses of veal feeding.

The table presented here shows the costs of making 160-lb. veal calves, based on birth weights of from 60 to 90 lbs., and with milk worth all the way from $1.00 to $2.00 per hundred. Note that with milk selling at $1.50 per hundred, a feeder would break even on his milk costs with veal at $6.56 per hundred when he started with a 90-lb. calf, but that it would require $9.37 per hundred to realize on milk costs when the birth weight of the calf is only 60 lbs.

Quite obviously, as birth weights decrease and milk prices increase, there is a point at which there is no profit in attempting to produce veal, particularly feeding up to 160 lbs. Still another important factor in the economics of veal feeding is the weight at which the calf is finished. Were it possible to make calves fat at three weeks of age, weighing say 120 lbs., profits would in increased, but unfortunately, except in beef-bred calves, kidneys do not begin to cover until they have been on feed at least three weeks, and as a consequence, not many dairy-bred calves make good veal at 120 pounds.

No wonder some calves die young. As a matter of fact, it seems as though perhaps those

CHART SHOWING THE PRICE PER HUNDRED POUNDS LIVE WEIGHT THAT CALVES MUST BRING IN ORDER TO PAY FOR MILK AT VARIOUS PRICES PER HUNDRED POUNDS

Birth Weight Lbs.	Lbs. Gain Required to Make 160 Lbs. Veal	Lbs. Milk Required to Make 160 Lbs. Veal	Costs of gains with 100 Lbs. Milk at $1.00	$1.50	$2.00	$2.50	Price per hundred pounds calves must bring to break even on milk consumed at following prices: $1.00	$1.50	$2.00	$2.50
90	70	700	$ 7.00	$10.50	$14.00	$17.50	$4.37	$6.56	$ 8.75	$10.56
80	80	800	8.00	12.00	16.00	20.00	5.00	7.50	10.00	12.50
70	90	900	9.00	13.50	18.00	22.50	5.62	8.04	11.25	14.06
60	100	1000	10.00	15.00	20.00	25.00	6.25	9.37	12.50	15.62

dairymen who consider the calves from their average or poorer than average cows more of a liability than an asset and dispose of them just as quickly as possible, are thoroughly familiar with the economics of calf-raising. At the same time, the dairyman who has good cattle of demonstrated ability and takes good care of his calves, will usually find added profits, as well as the means to herd improvement.

Good dairy cattle are still in the minority, and command such a substantial premium over inferior stock as to warrant giving their calves the attention which they deserve.

Alfalfa

THE importance of alfalfa strains resistant to bacterial wilt was demonstrated this summer to Kansas farmers by their experiment station. Kansas 308 yielded an average of 8,398 pounds an acre as compared to 6,932 pounds for Grimm. In a period of 7 years, susceptible varieties, such as Kansas Common, Grimm, and Utah would decline to a zero stand, while resistant varieties such as Hardistan, Kansas 308, and Ladak would still stand 90 percent or better.

—*Successful Farming*

New Cotton Services

Condensed from Southern Agriculturist

W. B. Lanham

Bureau of Agricultural Economics

CONGRESS has now made it possible to extend cotton classing and market news services of the Bureau of Agricultural Economics to groups of growers organized to promote the improvement of cotton. These services will be available for this year's production of cotton to those improvement groups that comply with regulations under the amended Grade and Staple Estimates Act.

For each bale of cotton of an improved variety ginned for a member of a qualified group, the Bureau will class a sample of lint and return the grade and staple classification of that sample to the grower or his designated representative. A sample of approximately 6 ounces, representative of both sides of the bale, is to be drawn, identified and prepared for shipment by the grower or the group. Instructions for sampling, transportation, identification tags, and containers for shipping samples will be supplied at government expense. No charge is made for classing the samples, but the samples become the property of the government.

The Act does not have as its purpose merely the free classing of cotton. Rather its intent is to provide classing for growers who have organized to promote the improvement of cotton, in order that these growers may know the extent to which the varieties they have adopted are superior to those formerly grown.

Data collected by the Bureau indicate that returns to growers of improved cotton have not fairly reflected market value of the better cottons. Premiums to growers for grades above Middling amount, on the average, to about a third of the premiums quoted on central markets. Discounts made to growers amount, on the average, to less than two-thirds of those quoted in central markets.

Such a distribution of the returns from the cotton crop indicates a poor reward to growers of the better cotton. It provides little incentive toward the growing of improved varieties.

The Act provides that improvement groups shall be supplied market information that shall include the market prices of cotton. This information will

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be distributed by the Bureau for use by the press and radio, and for direct delivery to improvement groups. The Act provides for the posting of this information at gins and postoffices and in public buildings and other public places frequented by farmers.

These local market news bulletins will show the central market prices for cotton and also the differentials that apply to the local point at which the grower's cotton is stored or offered for sale. With this information, the group or member can determine the extent to which central market premiums and discounts are reflected in local prices. Buyers can use this information to reflect the central market premiums and discounts better than is possible under a system of average or "hog round" buying.

The Bureau can supply classing and market news service without charge only to groups of growers organized to promote the improvement of their staple. It cannot deal with individuals.

Each group must name a representative authorized to deal with the Bureau, and all dealings between the Bureau and the group will be handled by that representative. The first step toward obtaining these services is the filing of an application. Applications may be filed with any branch classing office or direct with the Bureau's Washington office.

Information contained in the application shall be that required under the regulations. The regulations provide that seed planted shall be of the variety and seed stocks agreed upon by the majority of the members as best adapted to the community. The cotton shall be ginned so as to prevent mixing the seed or lint of one variety with the seed or lint of other varieties or with seed or lint from other communities. These regulations embrace, as part of compliance, required adherence to practices approved by the Department of Agriculture and State agencies for improvement of seed stocks and adequate protection of these superior stocks against deterioration. The application must set forth information showing that the group is complying, or in position to comply, with the regulations.

The benefits of the new cotton classing and market news service are not aimed at 100 per cent immediate returns to growers. It is the intent of the sponsors of the Cotton Classing Act and the expressed wish of those who will administer the Act that the services may work toward a permanent benefit to cotton growers and to the cotton industry as well.

Nutrients, Not Tons Per Acre

Condensed from Certified Milk

J. W. Barlett, Ph.D.
Professor of Dairy Husbandry, New Jersey Agricultural Experiment Station

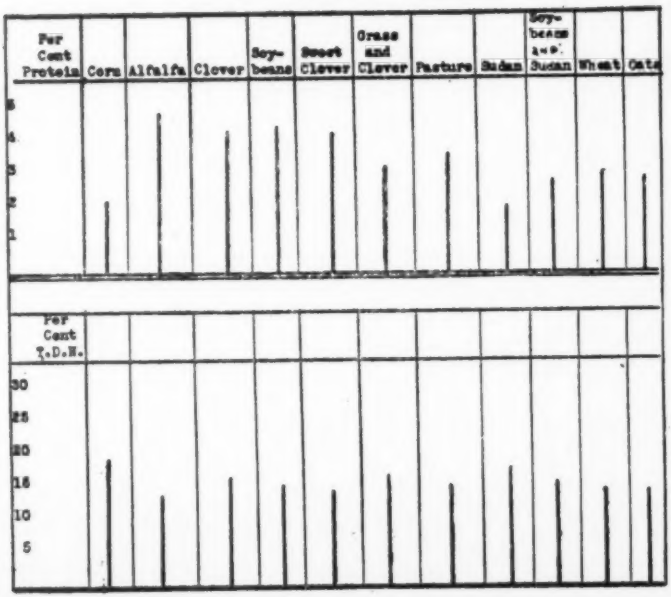
IF you ask one of the several thousand dairymen who have put grass in the silo within the past year or two why he did it, he may give you one of several answers. He may say:

1. It helps me get my hay harvested in wet weather.
2. It cuts down on planting so much corn.
3. It gives me a cheap feed.
4. It puts color in my milk.
5. It reduces the need for dry hay storage.
6. My neighbors did it and liked it, so I tried it.

Grass ensilage, although not a new feed, has had the greatest boom of any dairy farm idea in a long time. It seems sound, and is apparently here to stay, as it fills a great need in the North-

TABLE No. 1

Protein and Total Digestible Nutrient Content in 100 pounds of various crops used for ensilage



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east. The answers of the man who has preserved grass are all true, and we can find many more, but it seems there is one great big "answer" that looms before us around which some one should build a slogan.

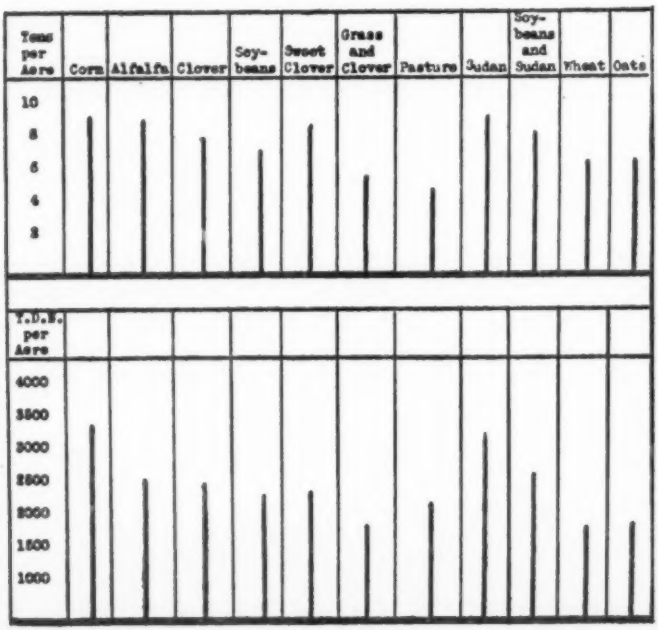
The "Truth about Grass Silage" is that we must now think about "Nutrients per acre," not just tons per acre. Every economical method of taking more feed nutrients from our grass land saves directly in the feed bill.

If we look at Table 1 which gives us the Protein and Total Digestible Nutrient Content in 100 pounds of our various crops which may be used for silage, we notice the comparative values of the several crops is very close in total digestible nutrients. Alfalfa stands out as a leader in protein value, and corn is at the top of Total Digestible Nutrient value.

However, when we turn to study Table 2, we seem to get a little disappointment. The figures shown here are average green weight yields in tons per acre, and Total Digestible Nu-

TABLE No. 2

Average yield per acre of various crops used for ensilage in New Jersey



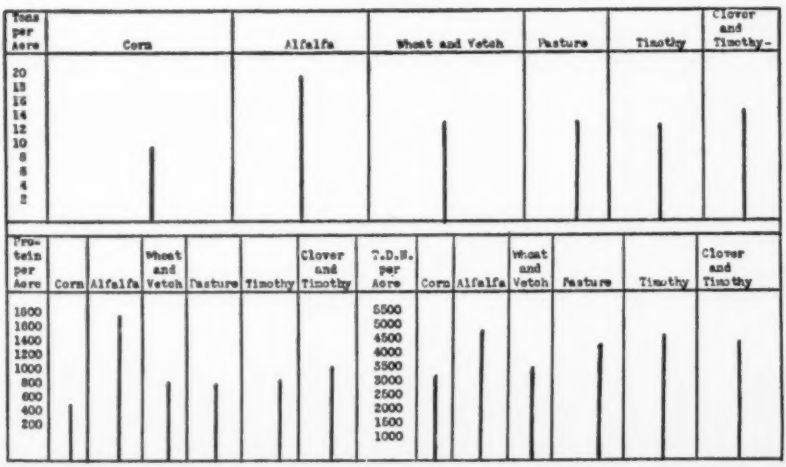
trient per acre of the same crops shown in Table 1. While the yields in tons are not far apart, we get our greatest setback when we notice that outside of sudan grass, corn leads all other crops in Total Digestible Nutrients by approximately 800 pounds per acre.

Now let us turn to the Truth About Grass Silage. The farmer, if he is a good one, usually spreads from fifteen to twenty tons of stable manure on his best land for corn. Again he usually puts some commercial fertilizer on his crop. It may cost him $3.00, $6.00, $8.00 or more dollars per acre to fertilize his corn ground, and he still must cultivate the crop several times during the season. Our average corn yields for New Jersey are yet less than ten tons per acre.

If we turn to Table 3, which gives yields of grasses and legumes on some New Jersey farms under a grass land program for 1937, we have a very different picture, and the possible truth about grass silage. Here we are, it is true, comparing fertilized and managed grass and legume crops with average New Jersey corn, still we can say that the average corn was also fertilized. What we bring out is the possibility of growing nutrients per acre in terms of grass and legumes, when we put the same emphasis on management and fertilizer that we do with corn.

TABLE No. 3

Yields of grasses and legumes for silage on some farms under grassland Management compared to average corn yields (1937)



An acre of alfalfa gives four times, approximately, as much protein as average corn. We have grown 1600 pounds of protein to the acre of ground. You may say it is possible to grow 20 tons of corn to the acre. Even if you do that, this acre of alfalfa still yields twice as much protein as the acre of corn. It is worthy of note to study the Total Digestible Nutrient value of alfalfa, wheat, and vetch, and even pasture under this program.

Some may say we have upset our protein-carbohydrate balance by increasing our protein yields per acres. This is true if we compare alfalfa to corn and assume that corn is in correct balance.

There are two ways to overcome this danger. First, we may reduce the protein content of our grain ration, or second, we may add molasses to our silage in excess of that needed for preservation.

Take a look at Table 4, which is an analysis of grass and grass silage taken from the same silo on both a dry and wet basis as the crops were put in the silo and taken out several weeks later. The protein content of the silage compared to the grass is approximately the same. There has been a slight increase in fat. The interesting thing, however, is the very small amount of loss in Nitrogen Free Extract. This is what we would call our sugars, or carbohydrates, the material required in the formation of acetic acid to preserve our grasses. The loss here is less than two per cent on a hundred-weight basis.

Prof. C. B. Bender of our Station, and one who champions grass silage, states that for every 100 pounds of molasses added per ton of green material, we add 2.8 parts of Total Digestible Nutrient. Therefore, the addition of molasses in amounts greater than that needed for grass preservation should build up the Nitrogen Free Extract to a point where we shall have a better balance of nutrients in our grass silage, an improvement capable of overcoming any upset in the balance due to the increase in preservation of high protein grasses or legumes in the silo.

TABLE No. 4

Anaylses of green materials and ensiled aliquots of the same green materials

	Percentage on Wet Basis		Percentage on Dry Basis	
	Grass	Silage	Grass	Silage
Moisture	71.46	73.28	0.00	0.00
Protein	3.59	3.28	12.35	12.17
Fat	0.82	1.48	2.84	5.57
Fiber	8.09	7.51	28.19	28.18
N-Free extract	14.07	12.64	49.05	47.27
Ash	2.15	1.82	7.57	6.81
F_2O_5	0.17	0.25	0.59	0.91

At the Finish!

Condensed from Turkey World

Frank Keane

GETTING a fine degree of finish on market turkeys means topping the market, satisfied customers, and a constantly growing demand for one's turkeys.

In spite of all that has been said and written about producing quality turkeys, a very large percentage of turkeys is marketed in poor condition every year. All that is needed to convince anyone that this is true is a visit to the commission houses during the main marketing season. It seems that turkey growers always get "panicky" and market their birds at holiday time, regardless of the quality of their finish. They have a fear that prices will be good only at holiday time, and that they will not be able to market their birds at a profit later in the year.

We never market our birds until they are properly finished, and have never had trouble in getting good prices for our early or late birds. In fact, we think the holiday season is one of the poorest times to market our birds. The market is flooded with turkeys of all kinds at that time, and competition is at its keenest.

Following the practice of sorting our birds carefully and selling only well finished birds has paid us well. Buyers have learned that they can always depend upon the quality of our birds, and they are willing to pay a few cents per pound over regular market quotations.

The formula is—*keep plenty of good fresh feed before the growing turkeys from day-old to maturity.*

I have heard about turkey growers who claim they can rough their birds through the main growing season and "fatten them out" in the fall with a good finish, but I have failed to ever *see* any good results of this kind. It just can't be done. I have examined many turkeys handled in this way, and they *do not* have good market quality.

We follow a rather standard type of feeding program. The poults are started on a good commercial mash, which is kept before them constantly until they are around eight weeks old. A good growing mash is used from that time to the finish. Grain feeding is started early, usually when they are about four weeks old.

On range during the summer,

Reprinted by permission from The Turkey World, Aug., 1938, Mt. Morris, Ill.

the main grain feed is whole oats. The grain mixture is about 80 percent oats and 20 percent corn. Turkeys do well on oats during warm weather. The percentage or corn in the grain mixture is gradually increased as the season advances.

Perhaps whole corn would be just as good as cracked corn, but it is our opinion that the birds eat more of the cracked.

We like to flush our birds occasionally during the summer. To do this, we use commercial condensed buttermilk. We mix the milk—just as it comes from the barrel—with bran. We prefer the mixture sticky rather than crumbly. The regular feed is taken away from the birds late in the evening, and they are given all they will eat of the milk-bran mixture until noon of the following day, when their regular feed is resumed. Flushing seems to keep them in good trim, and is just one more step to keep them growing at top speed and to prevent disease.

The amount of corn in the grain mixture is increased about the first of September. There is nothing like corn to finish out turkeys.

We also start feeding milk at this time of the year, and we soak the cracked corn in milk. Commercial condensed milk is mixed with water at the rate of one part of milk to seven parts of water. The cracked corn is soaked in this milk mixture for about 18 to 24 hours. The soaked corn is fed in the late afternoon, giving the birds all that they will clean up in about an hour. Feeding of soaked grain is started gradually, and the amount increased as the season advances. The dry grain mixture is kept before the birds at all times.

Feeding milk and soaking the grain will really *get the finish.* The milk keeps the birds toned up, and gives them greater appetites. The quality of fleshing is very superior when milk is fed. It seems to us that milk-fed birds develop a superior creamy skin color, neither yellow nor white. The fine physical condition of milk-fed birds also helps them to resist disease. Feather development also seems to be superior.

Due to the large volume of unfinished turkeys that go on the market every year, it appears that a great many growers just market their turkeys whenever they get ready, without examining them to determine the degree of finish.

I would like to pass on to others a simple way to tell when turkeys are properly feathered and are ready to be marketed. Examine the under side of the wing web. If there are still a few poorly developed pin feathers or hidden pins, don't sell the bird. On the other hand, if there are

no poorly developed, inky or hidden pins, and the short feathers on the wing web are fairly well developed ("brush out" is the term I use to describe this), the birds are ready.

Of course, there are other ways of determining finish, but this one is quite simple, and the birds can be handled rapidly when it is used.

Blueberries

WHILE some of the newer brambles have taken a good share of the small fruits spotlight during the past few years, there has been increased interest among small fruits enthusiasts in blueberries.

George Morse, New York Horticultural Society's president, reports concerning his experiences with blueberries: "The blueberry in my judgement offers the most promising profit of any of our present day fruits. They come into bearing young, are as long lived as an apple tree—75 years and upwards—yield large crops annually, are hardy—having withstood a temperature of 40 degrees below zero—and have even endured several degrees of frost when in full bloom. The blueberry has no thorn, therefore is most pleasant to work around. It does not stool or spread, therefore is easily kept in bounds. Plants are set four feet apart in the row. Cultivation is similar to that for raspberries.

"One question concerning blueberries often asked is: 'What is the difference between huckleberries and blueberries?' The difference is primarily in the seed. Huckleberries have 10 comparatively large seeds like minature peach pits, which crack between the teeth when eating them, while the seed from the blueberry is so small that you do not distinguish them when eating.

"Blueberries seem to do best in rather light acid soil. It may be either sand, light loam, peat or muck. They do not like a heavy clay or crusting soil. Limestone soils are not suitable for their best production. I have seen them growing and fruiting on soils with a pH reading varying between 3.2 and 5.7 A pH reading of about 4.4 is probably ideal.

"Earlier varieties like Cabot and Adams begin ripening the first days of July in our section. Then follow in succession the Pioneer, Rancocas, Concord, Rubel, and Jersey. The latter two hold some of their fruits until way along into October if allowed to by humans and migrating birds."

—*American Fruit Grower*

The Care of the Herd Bull

Condensed from The Shorthorn World

Dr. O. P. Bennett

A great deal has been written in recent years about the importance of selecting a high quality, prepotent herd bull and the many qualifications that should be sought for and found in such an animal. However, few writers have mentioned the fact that fertility is an inherited characteristic just the same as coat color, milk production and speed. Certain breeds of livestock and various families of the same breed are more fertile than others. It is well then to give this factor some consideration when a selection of a breeding animal is to be made.

Efficiency of reproduction should be the goal of every breeder. Mismanagement and improper care of their inmates have been the ruination of many breeding establishments. The management of the breeding herd should be and is one of the most important considerations in our whole field of breeding. It alone often determines whether our efforts and plans result in success or failure.

It is unnecessary to write that every herd bull should be made as comfortable as possible in his stall or paddock, protected from the heat of the day and from annoyance of flies and other insects. Exercise and feeding are questions requiring our best thought and consideration.

Proper exercise is one of the basic needs of all breeding animals and especially so for the male of the species. Without sufficient exercise it is impossible to keep any animal in first class physical condition.

The manner in which the bull is exercised does not matter much. However, he must not only be given an opportunity to exercise but he should be made to do so. If this cannot be accomplished in any other way he should be led or driven several miles each day. While it is quite possible I am mistaken, it is my impression that, while many herd bulls are given an opportunity to exercise, few of them take advantage of it or are compelled to move about as they should for their own and their breeder's good.

The feeding of a bull is of the utmost importance. He should not only be given the proper feed but given it in such quantity as would keep him in excellent and vigorous health.

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The cause of sterility or a great degree of loss of breeding power may be due to improper feeding as well as to the lack of exercise. Many of our best show specimens sooner or later become sterile due to overfeeding, resulting in fatty degeneration of the reproductive organs in both males and females and the closing of the ducts leading from ovaries and testicles by deposits of excess fat about them.

So much has been written in recent years about a balanced ration, vitamines, enzimes and amino-acids that I often wonder how we were able to properly feed, breed, or show cattle, or how the human race even survived without this knowledge. All the information given us on these subjects has been interesting and helpful and should be welcomed by all, but the fact remains that nature has been so lavish in the supply of these essentials in the various foods consumed by us and our animals that we have gotten on very well even before the day of so much scientific knowledge.

Theory and practice have both demonstrated that there is no one grain so suitable as food for breeding stock of all kinds as a good quality, heavy weighing oats. Those who can afford a crusher or roller to crush, rather than grind them, will find them much superior fed this way.

Oats, or whatever mixture of grains is used, should be accompanied with a liberal amount of protein. The proteins are undoubtedly the most essential of all food elements, as they are found extensively in every structure of the body, being the greater part of all muscle tissue, the chief constituent of the nervous system, the internal organs, and are found even in bones, skin and hair.

The proteins are also the most complex of all food elements and in the process of digestion are broken down into at least twenty-two different amino-acids, which are soluble in the juices of the digestive tract and which, absorbed from the intestinal walls, pass into the blood stream and are carried to every organ and structure of the body to be used for growth and repair. This but serves to illustrate their very great importance. Certain amino-acids are absolutely essential to an animal's welfare while others are less important in value. Unless the ration given our livestock is adequately supplied with these essential amino-acids, protein tissues can not be properly built within their bodies, and a much greater amount of food must be taken to provide the same amount. For example, zein, the chief protein of corn, lacks two of the very important amino-acids, and for this reason addi-

tional proteins which contain these essentials must be furnished to get the greatest benefit from the corn fed for whatever purpose.

Linseed meal contains the greatest number of essential acids of any single source and careful experiments have shown that it furnishes quite a satisfactory supply of them all if it alone is fed with the grains. However, there are many breeders who believe a mixture of proteins, because of the different amino-acids they contain, is superior to linseed meal alone. It is my opinion that whatever mixture of proteins may be fed to bulls, linseed meal should constitute the greater amount of it.

Vitamines are essential to the well-being of all of the animal kingdom. Vitamines A, D and E are especially necessary for cattle. Fortunately for us, good leafy alfalfa hay is an excellent source for Vitamin A, has an appreciable amount of Vitamin B, a good source of Vitamin D, an excellent source of Vitamin E, and a good source of Vitamin G. Green and growing grasses are excellent sources for Vitamin C. These roughages, along with some wheat middlings, which is particularly desirable for Vitamin B and C, supply the animal with all of its vitamin needs. Wheat germ oil containing a goodly amount of vitamin E has been used very popularly in the treatment of sterility. It has no effect whatever upon the reproductive system except as it supplies any deficiency of this particular vitamin which can be just as well supplied with proper feeds.

With the exception of common salt, our feeds, if grown on land containing the proper proportion of lime (calcium rich land), have sufficient of the other necessary minerals. Unfortunately many of our livestock breeders are very gullible and purchase expensive minerals, stock foods and other compounds to feed to their livestock expecting them to exert some sort of super-natural power.

The wise feeder will ascertain such deficiencies as there may be in his rations and supply them with proper feeds rather than by mixtures that are said to be cure-alls for all kinds of ailments.

To recapitulate, (1) a bull should have sufficient daily exercise to keep him active and healthy; (2) crushed oats with flour middlings supplemented with a more than liberal supply of proteins, together with clover, alfalfa, both green and cured, afford a ration that will keep a bull healthy and his reproductive processes at the peak of fertility.

Feeding and Breeding for the Market

Condensed from The Rural New-Yorker

R. W. Duck

OUR livestock feeding and breeding programs should be so regulated that they can result in a finished product which meets some specific market demand. It is equally if not more important that the product, whether it be meat, milk or wool, arrive on the market at the maximum seasonal advantage in order to obtain top price relative to market swings.

Early arrivals of Spring lambs always command premium prices. As soon as heavy runs of southern lambs begin to arrive a marked decrease in price is the inevitable result. A study of lamb prices per 100 pounds at Chicago for a ten-year period beginning in 1927 shows an approximate average decline of 10 percent for May as compared with April prices. October and November have an average low, with a price between $8 and $9 for this period, these Fall lambs being largely sold on a feeder lamb basis.

In general, under ordinary farm conditions where maximum utilization is being made of home-grown grains and roughage, rapidity of gain is correlated with economy of gain. Availability and price of feeds used, as well as type, quality and finish desired in the lambs are all important determining factors relative to profit or loss made in a given feeding operation.

Recent lamb feeding investigations by Cox and Wagner at the Kansas Experimental Station relative to the value of dry skim-milk powder as a source of protein in feeding lambs is a good illustration of the feeding factors mentioned. In these tests powdered skim-milk was compared with cottonseed and linseed meal as a supplement to grain, with feeder lambs averaging a little over 100 pounds initial weight. The feeding period was from January 20 to April 5, 1937. The average feed consumed daily per lamb was, grain 1 pound and .2 pound cottonseed meal, linseed meal and powdered skim for the three lots respectively. Silage consumption was the same in all three groups being 3.65 pounds per head daily. The cottonseed meal lambs ate .23 pound daily of straw, the linseed group .25 pound and the powdered skim-fed lambs .28 pound of straw.

Reprinted by permission from The Rural New-Yorker, Sept. 10, 1938, 33 West 30th St., New York City

The feed requirement to produce 100 pounds gain for the cottonseed meal group was, grain 560 pounds, cottonseed meal 112 pounds, straw 128 pounds and silage 2,045 pounds. The linseed meal fed lambs required 595 pounds of grain, 119 pounds of linseed meal, 147 pounds of straw, and 2,175 pounds of silage per cwt. gain. The powdered skim-milk lambs required 516 pounds of grain, 103 pounds of powdered skim, 142 pounds of straw and 1,886 pounds of silage. The average daily gain made per lamb was .18 pound for the cottonseed meal group, .17 for the linseed meal lambs and .19 for the powdered skim fed lambs.

The feeding of the powdered skim resulted in a greater daily gain and an increased efficiency of production. The economy of production interpreted in terms of cost would vary with the cost of the powdered skim as compared with the protein supplement mentioned, and the feeds replaced.

Where skim-milk is available on the farm or where it can be obtained at low cost its more extensive use as a protein supplement in feeding and fattening livestock deserves our careful consideration.

Kenwood Mills, H. M. Ashby, president, have recently established a sheep-breeding, feeding and wool project on their farm located near Springwater, Livingston County, N. Y., which is unquestionably the most important and valuable experiment of its kind ever undertaken in the East.

The object is to ascertain if sheep can be profitably produced on eastern farms from both a mutton and wool consideration. Accurate figures will be kept of all costs and returns.

Their method of purchasing the foundation ewes is of value and can be strongly recommended to prospective sheep breeders. Three hundred foundation yearling western ewes were bought from a band of fed western lambs numbering about 3,000 head. These lambs originally came from Bitter Creek, Wyo., and were bought and fed by Gilbert Prole and Dennis Phelps, Basom, N. Y. They went into the feedlot around Thanksgiving and came back to market in the late Winter averaging 90 pounds in weight. The Producers Livestock Organization, East Buffalo Stockyards, or other reliable firms could easily make selections as desired of fed western ewes suitable for foundation breeding ewes.

The advantage of purchasing such ewes is that they have become acclimated, they have their entire breeding life before them, they are in good physical condition, in good health, and they

can be purchased at their prevailing market price per pound. They could be purchased at the yards in the Spring as the fed lambs are marketed in any numbers desired and shipped by truck or in carload lots, or their purchase could be arranged direct by going to the farms of those engaged in feeding western lambs.

The western ewe offers the maximum in close flocking and hardiness, combined with easy keeping and being good mothers. Crossed on the framier, meatier type rams of the different breeds they will produce lambs which can go to market as either Spring, feeder or as later Fall fattened lambs. The size of such fine-wool range ewes has an important relation to production as has been shown by data compiled by W. E. Joseph, of the Montana Experiment Station. Results were kept at the Station on four lamb crops from 333 range ewes of fine wool breeding. In weight the the ewes ranged from 80 to 159 pounds when mature. The average age of the lambs when weighed was 148 days.

Thirty-three such ewes weighing less than 100 pounds produced an average of 68 pounds of lamb and 9.3 pounds of wool annually. Seventy-two ewes weighing from 100 to 109 pounds per head produced 74 pounds of lamb and 9.6 of wool. Ninety-eight ewes averaging each 10 pounds heavier are credited with 79 pounds of lamb and 10.1 pounds of wool. Seventy-five ewes from 120 to 129 pounds produced 84 pounds of lamb and 10.4 pounds of wool. The last group of 55 head averaging from 130 to 159 pounds produced 89 pounds of lamb and 10.8 pounds of wool. The percentage of twins was also higher with the ewes weighing from 110 pounds up.

Chinese Farmers

Condensed from The Prairie Farmer

John L. Strohm

CHINA has the earth's largest crop of farmers. There are more than 300,000,000 of them living in mud-walled houses with straw roofs overhead and dirt floors underfoot. And they manage to live and raise a family on about $30 a year—not enough in America to buy an ornery mule.

Any country with that many farmers has to be large, and it is. It is so big that there are nine distinct dialects spoken by the Chinese. It is as if Maine potato growers, Mississippi cotton pickers, Texas cow punchers, California press agents, and Illinois corn huskers could not understand a word the other fellow was saying.

China is a country of paddy-like farms, each farmer tending an acre or so. The mud-walled homes are grouped in clusters of eight or ten. Each of these small settlements of farmers has a farm god which they worship.

The Chinese farmer barely manages to keep himself and most of his family alive with his $30 a year. He may grow rice, opium, peanuts, or wheat, depending upon where he lives. He has pigs and chickens, and uses a cow or water buffalo to pull his plow which is fashioned from a crooked tree. And he is good to the animals—he lets them wander into the house at will, and sleep under his roof at night. (If he keeps them outside, they may be stolen.)

He does not buy much—perhaps a hoe, a plow share, some seed, his tobacco, some overall-like goods and salt. He uses rice as bread, peanut oil for light and heat, and when he gets three full meals a day he is living in luxury.

The average Chinese farmer leads a hard life. He is friendly, philosophically accepting his poverty, and smiling through it all.

China has solved the problem of traffic accidents by having less than 10,000 miles of railroads and but 25,000 miles of passable roads. For transportation they use miniature mules which are slow but sure; rickshaws which coolies pull for two cents a mile; camels; sedan chairs; and an occasional motor car.

A Chinese feast is a combination of a threshing dinner and a family picnic. They sit about a

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round table, without plates; all eat from the same dishes. Their chopsticks dart out for a choice morsel which they eat if they are hungry, but which they give to their neighbor if they are polite. Many Chinese dishes are delicious and their cooks have grown famous with such delicacies as shark's fins and bird's nest soup.

The Chinese like to bargain. There are no price tags in China —you must argue, threaten, protest, wave your arms and start to walk out of the shop before you can get it reduced to the proper price.

The majority of the farmers cannot read or write. But if you tried to learn to speak Chinese and write their chicken tracks, you'd sympathize with them. There are more than a half dozen distinct dialects in the country and in each dialect one word may be pronounced several different ways to mean other things. So instead of saying "grape jelly" you might say "hog tankage." A missionary tried to tell the Chinese that he just "loved to preach to the Chinese." His congregation walked out. He had the right word but the wrong tone, and what he really said was, "I would just love to butcher the Chinese."

You can wear almost anything in China and not be out of style. Some men wear the kimona over long underwear, while some wear trousers and a loose jacket. Women may also wear trousers, but usually wear dresses fitting tightly around the knees on both sides.

Experienced observers believe the biggest problem China faces today is the necessity of helping the farmers, who make up 80 per cent of China's population. Famines occur annually in some sections of the country and sometimes millions starve to death. Until this agricultural class, the backbone of the nation, is educated and better off financially, China cannot hope to make a great deal of progress.

There is No Monopoly on New Ideas

Condensed from Nation's Business

Fred E. Kunkel

ABOUT 18 years ago, when Coble E. Grimes was only 17 years old, his failure to sell 10 dressed chickens led to the establishment of a new enterprise in Fredericksburg, Pennsylvania.

He had failed to sell 10 of his 25 chickens at a market stand. Rather than take them home, young Grimes cut up his 10 chickens into legs, breasts, wings and backs and offered to sell any part to the few straggling customers who remained in the market. To his great surprise the choice parts were snapped up by eager housewives almost as fast as they were discovered.

He took the less salable parts such as wings and backs to a restaurant, made a bargain price, and went home to his father bragging that he had made a complete sell-out.

That was the beginning of the cut-up poultry business for Mr. Grimes. Today he has a plant in Fredericksburg that employs more than 80 men and women. He sends out more than 20,000 dressed chickens weekly to his 20 retail outlets through the east.

Until about five years ago he had no competitors in the field, but the popularity of cut-up poultry demanded recognition from other meat and food merchants who had originally scoffed at his ideas.

He raises 72,000 chickens in one building and 35,000 more on neighboring farms. Barred Rocks and New Hampshire Reds are the only varieties he grows. He buys day-old chicks every week, raises them to three-, four- and five-pound sizes and slaughters them when from 9 to 13 weeks old.

Grimes maintains that he grows and dresses his own poultry so that he can guarantee his merchandise.

By controlling his raw product and feeding them his own choice of food, he knows how they will taste when broiled, fried or stewed, how long it will take for cooking, and is assured of a uniform product—all of which helps to prevent customer complaints.

Experience and experiment have taught the proprietor how to improve his product in accordance with his customers' de-

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Chamber of Commerce Bldg., Washington, D. C.

mands. For example, he believes that feeding yellow corn to his chickens improves the deep yellow tinge of the skin. He feeds only one brand of prepared chicken feed, in addition to cracked corn and buttermilk. He uses automatic drinking fountains and uniform heat in all his buildings. He discovered that by feeding buttermilk daily he did not have to use poultry remedies or employ a veterinarian to care for his stock. The health of his flock is also guarded by his policy of disposing of every chicken before it is 14 weeks old.

His poultry slaughter house is equipped with the best equipment he can buy. Live chickens are delivered to the second floor where they are fed and housed until ready for the butcher. They are killed as needed, dropped down a chute to the dressing room where they are scalded, picked, washed, drawn, cooled and put on a track, weighed, packed in barrels of ice and placed in a refrigerated room. The next morning they are hauled by truck to the Grimes retail markets along the eastern seaboard.

As his business grew, Grimes trained his help in his own way and helped them grow up with the business. He is partial to neither city nor country boys—both types have fitted into his organization satisfactorily. Thirty of his 80 employees handle the raising, slaughtering and preparation of his product for the market stands.

Practically all of his employees, including those in the retail markets, receive their meals as part of their pay. Grimes has made that point an important part of his business. To provide milk for his boarders, he bought a few cows and later enlarged the herd to 90 so that he could operate a milk plant in nearby towns. On 140 acres of farmland he not only raises food for his poultry and cows but also for his boarding tables.

He feeds 350 hogs from the waste of his poultry business and whatever surplus he has left after satisfying his own food requirements is sold on the hoof.

Peach Progress

Condensed from American Fruit Grower

Dr. F. P. Cullinan

U. S. Depart. of Agriculture

MUCH of the acreage set to new peach varieties is to replace orchards which have gone out on account of age and injury following cold winters of more recent years. In addition, of course, there is some new planting.

Among the older varieties, there is no outstanding commercial freestone coming in ahead of Golden Jubilee. Golden Jubilee is one of the best early freestones, and where it can be well grown it is of good quality and size. During recent years, a number of varieties of promise coming in after Golden Jubilee and ripening up to the Elberta season have attracted attention. These are, in order of ripening at our station during the 1937 season, Golden Globe, Maxine, Eclipse, Golden East, Vedette, Halehaven, July Elberta, Valiant, and Veteran.

In nearly all peach growing sections of the eastern United States, peach trees will not make satisfactory growth unless there are fairly liberal supplies of available nitrogen in the soil. In years past this nitrogen has been obtained by growing peach trees principally through cultivation of the soil. This continual stirring of the soil, resulting in the breakdown of the organic matter and the release of soluble nutrients, has supplied the nitrogen requirements of the trees.

In most of our soils, however, sufficient nitrogen for the best tree growth cannot be obtained through cultivation alone. Growers have also supplied the nitrogen requirements of peach trees with applications of barnyard manure. Under such treatment peach trees do very well, but this source of nitrogen is no longer available in sufficient quantities and the peach grower must rely upon annual applications of some of the inorganic sources, such as nitrate of soda, sulphate of ammonia, or cyanamid.

The certainty of annual crops cannot be predicted with the peach to as great extent as with the apple. It may be good economy, therefore, to wait and see how the buds survive the winter temperature before applying fer-

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tilizers. We know that when nitrogen is applied to peach trees in the fall some it it is taken into the roots and stored there. In early spring an increase in nitrogen content can be determined in the new twigs.

There has been considerable experimental evidence in recent years to show that applications of a readily available form of nitrogen, if applied while trees are in bloom, or even three to four weeks later, will not seriously affect color of the fruit. On the contrary, in order to obtain satisfactory terminal growth and to produce vigorous leaves, which are so essential in producing color of fruit, nitrogen is needed.

I think we can be quite safe in saying that it is not necessary to cultivate the peach orchard as frequently as has been done in the past in some of our important peach growing sections. There are certain definite advantages in the use of cover crops in the peach orchard. Where soils are not of sufficient depth to store large quantities of water in winter and early spring, and thus are not able to support the growth of the tree and cover crops during the summer months, certainly a winter cover should be used, not only for its beneficial effect in preventing erosion, but also for its nutritional value to the trees when disked under each spring.

The cover crop also serves an important function in utilizing mineral elements, particularly nitrate nitrogen, and thus reduces the leaching of these materials from the soil in winter. It is a conservation process, since these materials are made available to the tree upon decay of the plants.

Experimental evidence indicates that we probably cannot expect to increase the organic matter content of the soil, but if by soil management practices we are able to maintain the level of organic matter originally present in the soil, or prevent its too rapid destruction and loss, the use of cover crops will be well worth while.

The problem in the old peach orchard is somewhat different from that in the young orchard. If considerable top soil has been lost by years of cultivation, it may be difficult to obtain a good stand of cover crop. Whatever the cover crop used, it should be seeded in time to obtain a fairly good top growth before being checked by cold weather.

Fertilization of the cover crop to obtain a good growth is quite important. The same fertilizer practice that has been found necessary to obtain the best growth of the cover used when grown outside the orchard should likewise be used to obtain the best growth of this cover when used in the orchard. A good growth of cover has been ob-

tained in old peach orchards where a fertilizer high in nitrogen and phosphorus has been used at the time of seeding.

If erosion has been rather severe in an old peach orchard, the use of mulching material brought into the orchard might well be considered as a means of preventing further erosion and thus aid in moisture conservation through the effect of the mulch.

As the peaches increase in size or volume during growth, the ultimate size will in large part be determined by the number of fruits carried on the tree. Under conditions favoring abundant blossoming and a heavy set, volume increase during the first growth stage may not be as great as where the set is lighter.

A heavy set of fruit on a peach tree constitutes a considerable drain on the nutrients; hence, if too many fruits are allowed to develop, there may not be sufficient nutrients to take care of the growth of all the fruits and at the same time provide for adequate shoot growth and the production of leaves; consequently, near the end of the first growth period we frequently notice a heavy shedding of fruits in what is commonly spoken of as the June drop.

On fairly vigorous trees there usually are too many fruits remaining on the tree after the June drop, It is apparent under these conditions that even with a fairly liberal supply of nitrogen and good soil cultural conditions, including ample moisture, peaches will not make desirable commercial size. Under condition favoring a heavy load of fruit, the leaf area is usually inadequate to manufacture food materials necessary for the best enlargement of all of the fruits.

In the matter of thinning, the question of time logically comes up. We have been carrying on experiments during the past few years to study the effects of early thinning on increase in size of fruit, leaf, and shoot development and fruit bud formation. These studies indicate that on the early ripening varieties reduction in the number of fruits before the June drop has greatly increased the size of the fruits at the end of the first swell. Not only has this early thinning had an effect on the size of the fruit, but there has been an increase in shoot growth and leaf size. With many of the early ripening varieties, this early thinning may prove economically worth while. With later ripening varieties, it is usually the practice to wait until after the June drop and then to remove many of the small sized and imperfect fruits.

It should be recognized that in the last analysis the number of peaches to remove from a tree will depend upon the size of the

tree and its bearing capacity. If the tree has the bearing capacity of one to two bushels only the number of peaches that will develop into 2¼ or 2½ inch size should be left to make up this amount of fruit. When the tree sets uniformly heavy, it is possible to thin to a distance of six to eight or eight to ten inches. In most cases, however, this cannot be done satisfactorily, so that the leaf area and bearing capacity of the tree should be taken into consideration. It might be that following a freeze all of the live blossom buds are found at the base of terminal shoots. In this case it may be necessary to leave all of these fruits, even though only an inch or two apart, or even touching, if the leaf area is sufficient to take care of this set.

The Perpetuation of Wildlife

Condensed from Soil Conservation

Ira N. Gabrielson
Chief, Bureau of Biological Survey

IN planning the national wildlife restoration program the Survey seeks to provide for three requisites. The first of these is for land to be set aside upon what may be called the hereditary wildlife ranges for the preservation of all native species. From these reserves the seed stock may be drawn whenever it is necessary or desirable to restock denuded areas. Extensive game and wildlife surveys provide the information to indicate the regions where these reserves should be established with the greatest prospect of success. Provision must be made to ensure against the total loss of any species through disease or some other natural disaster that may conceivably eliminate all the seed stock on a single preserve. For example, bison are to be maintained on several widely separated ranges and similar precautions will be taken with respect to other species.

It is anticipated that seed stock from these Federal reserves may be needed to carry out State and Federal restoration programs on areas made available under land-utilization programs.

The second objective of the program is to provide for the continuation of research work to accumulate factual information applicable to current problems, and also to enable wildlife administrators to anticipate future needs. Wildlife as a resource is subjected to constantly varying conditions by many physical in-

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fluences. These may be of natural origin or may result from engineering, industrial, or agricultural projects. The program is intended to furnish facts to enable wildlife agencies to obtain the most favorable results from such developments by setting up stations for regional wildlife research in selected land-grant colleges throughout the United States. Eleven of these already have been established and four more are needed to complete the project.

By attaining this objective the third requirement of the plan will also be met—that of providing for a carefully trained personnel to administer the wildlife resources of America in the future. There is now a serious lack of men who are qualified for this work. The land-grant college units will serve as research stations, and they will also offer to graduate students courses in wildlife administration similar in purpose to those offered in forestry.

The main objective of the wildlife restoration program now being developed by the Biological Survey is to prevent, if possible, the extermination of any valuable species, and to increase the numbers of such wild birds and animals to the greatest extent consistent with land-use requirements of the human population. Wildlife has a very great economic value, and it also furnishes a means for recreation and relaxation that may well become of more importance to human beings subjected to the increasing strains and stresses of modern ways of living and working than are its financial values. Several very valuable and interesting species were allowed to become extinct in those years before there was any general conception of the need for a carefully worked out wildlife conservation program that could be coordinated with agricultural and industrial activities. It is bad logic to argue that because there is no realization of a loss no loss has been suffered. The present generation of Americans never knew, nor can they ever know, the passenger pigeon and the heath hen, and it is a certainty that modern life is the poorer for the extermination of these birds. Then, too, there is always the active possibility that the extermination of any native creature may cause grave disturbances in the complicated organic system of a country. Evidences of and realization of such damage may not appear for many years following the disaster.

Such in brief is the philosophy underlying the restoration activities and plans of the Survey. Actually these plans have been developed over a period of more than 50 years of research and study by technicians of the Sur-

vey staff. Facts slowly accumulated throughout the period were brought together, like the sections of an aerial landscape photograph, until a definite, recognizable pattern appeared. When at last the means to proceed with a program were provided, the essential needs were known as well as the methods by which they could be met.

The principal need was for land. Bird landing, food habits, and habitat studies conducted for half a century furnished precise information as to type of land required to support each of the many different species. It was realized that, except for the habitats of such creatures as find suitable environmental conditions upon cultivated lands, most of the areas that might be devoted to the program would necessarily be of types not adapted to profitable agricultural uses, or where the soil conservation and water control effects of the wildlife management operations would be of vital importance to the general land-utilization program.

For the minimum requirements of waterfowl, about 7,500,000 acres of marsh and water refuge areas are needed on the breeding grounds, along the courses of the four major flyways, and on the wintering grounds used by these birds. About half of the required total has now been acquired or is in the process of acquisition. The areas making up the remainder are already known and can be acquired as means are provided.

To maintain adequate stocks of non-migratory species, including big game and upland birds and mammals in the United States, 3,968,000 acres have now been set aside and some additional lands are needed. The Nunivak Island Refuge in Alaska includes 1,111,000 acres. The completion of this acquisition and development program will not dispose of the problem, however, since conditions governing land use do not remain stable and immutable.They must change constantly to meet the constantly changing requirements of the people, and provision for the maintenance of wildlife must be sufficiently flexible to allow adjustment.

In addition to the regular appropriations made to the Survey for research, game management, and regulatory activities, two acts of Congress now provide moderate but continuing funds for a land utilization and development program. The first of these is the Federal Migratory Bird Hunting Stamp Act which annually supplies about two-thirds of a million dollars for land acquisition and use in the waterfowl restoration program.

The second is the Federal Aid to States in Wildlife Restoration Projects Act, authorizing the an-

nual appropriation of amounts equal to the revenues received from the 10-percent tax on arms and ammunition. The revenue from the excise has amounted to about $3,000,000 annually. Funds appropriated under the latter measure will be allotted to the States on a co-operative basis whereby each participating State pays one-fourth of the total cost of the projects undertaken under the terms of the act.

Inasmuch as the act principally requires and specifically encourages the State conservation agencies to use these Federal allotments to acquire and develop land for wildlife purposes, it is apparent that over a period of years many millions of acres of land will be gradually added to the total area now available for wildlife. It is of considerable consequence, too, that these projects will be supervised by the Biological Survey during development, and that the Survey is fully aware of the opportunity to exert its influence to make these operations contribute to the national soil conservation program.

Cow Mats

SPRINGING rubber mattresses about an inch thick, cemented to the concrete floor, are the latest thing in dairy barn equipment. Twin Oak Farms, Morristown, N. J., have found that cows do better when kept on these moisture-proof, cold-proof, non-skid mattresses. They replace the usual straw bedding in the stables. Much dust is eliminated by their use.

When a cow stands on the rubber mat, her hoofs sink into it, there is no slippage as she gets up or down.

P. B. Frelinghuysen, Twin Oak Farm's owner, claims the rubber mattresses will pay for themselves in the saving on bedding, says cows lying on the mattresses are free from udder troubles.

Eggs and Vitamins

Condensed from The Poultry Item

L. C. Norris

Department of Poultry Husbandry, Cornell University, Ithaca, New York

ANYONE who keeps a flock of hens chiefly for the income to be derived from the eggs is an egg manufacturer. He is in the business of producing a food product which has occupied a favored position in the human diet for many years. The hen houses represent the buildings of the manufacturing plant, the poultryman and his helpers the management and labor, the hens the machines, and the feed the raw material from which the eggs are made.

Present-day competition between manufacturers is based largely upon quality of product. Egg producers are no exception to this rule. Those poultrymen who produce eggs of high quality, in the long run receive a price for their eggs above that obtained by poultrymen who are indifferent to quality.

In order to distinguish between differences in egg quality, a system of grading eggs by candling has been evolved. This grading system emphasizes structure of egg shell, consistency of egg white, freedom from blood and meat spots and color of egg yolk as factors of quality. By other means, the flavor of eggs, size and shape of eggs and color of egg shell are also given consideration.

These procedures have been exceedingly helpful in improving the quality of eggs in respect to those things which have first appeal to the consumer. There appears to be no doubt that the average consumer desires a fresh egg of good flavor and excellent consistency of egg white and also that he favors eggs with yolks not too dark in color. But in these days when eggs are facing strong competition from highly advertised breakfast cereals for place on the breakfast table, it is questionable in my opinion whether those qualities in eggs which appeal to eye and taste alone are sufficient to meet this competition.

So I raise the question, "What is a good egg?" Is it not possible that the time has arrived when poultrymen should give further attention to this possibility that the answer given so generally in

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the past is not the complete one?

Just why do people eat eggs? Is it because they look and taste good or is it because subconsciously, at least, people feel that eggs are good for them and, in eating eggs, insist upon having those of good appearance and flavor? I believe that the latter answer is more nearly the correct one.

If people eat eggs because they feel that they are good for them, without knowing why, is it not possible that, in these days when much stress is being placed upon completeness of the diet, they may turn more and more to those foods whose specific dietary value is being emphasized by advertising or other means? If this is the case should not poultrymen also begin to emphasize the food value of eggs in order to meet this competition?

What is there in an egg which makes it good for people to eat? The answer is—proteins of superior quality, fat for energy, phosphorus for bone development, iron and copper for blood formation, and vitamins for growth and maintenance of health. By eating eggs people reduce the danger of their diet being incomplete in nutritive essentials. These are the reasons why eggs are good for people.

The following example is an illustration of this point. Eggs produced by hens fed a standard ration containing controlled amounts of yellow corn, alfalfa meal and fish oil, all of which are good sources of vitamin A, contain, as far as I can determine from available data, from 800 to 1000 U. S. P. units of vitamin A per egg. A couple of such eggs per adult per day will go far in meeting the need for vitamin A, in view of the fact that the minimum individual requirement appears to be about 3000 to 4000 units per day.

Contrary to the former beliefs of many people, a hen does not lay a standard product. *The nutritive value of eggs depends to a large extent upon the quality of the ration fed.* If the ration is low in vitamin A, the eggs produced by the hen will also be low in vitamin A. It is now known that the amount of other vitamins in eggs as well as vitamin A may be favorably influenced by the amount of these vitamins in the ration. These are vitamin D, E and G (riboflavin). Eggs of hens fed a ration adequate for hatchability are a rich source of vitamin G, the growth vitamin, and they can be made a good source of vitamin D, the rickets-preventing vitamin, by feeding hens a ration very rich in this vitamin.

In certain instances the mineral content of eggs may be influenced by feeding. It appears that the amount of iron and cop-

per in eggs is increased by feeding cod liver oil or by exposure to direct sunshine, but not by adding more of these minerals to the ration. The iodine and manganese content of eggs on the other hand can be increased by direct addition to the ration.

Other components of eggs may be influenced by the quality of the ration fed the hens the same as vitamin and mineral content. The illustrations just cited, however, are sufficient to show that the production of a good egg does not take place automatically but *only when the hens are fed a good ration.* In general the eggs of hens fed a ration which enables them to lay eggs which hatch normally, possess higher food value than eggs produced on a ration designed for egg production only. *But to get eggs rich in vitamin D, a larger amount of this vitamin than is required for hatchability must be fed.*

In conclusion I want to point out again that the value of eggs depends not only upon appearance and flavor but also upon nutritive properties—upon protein content, fat content, character of minerals present and amount of vitamins contained in them. *Some eggs are of greater food value than others due to the quality of the ration fed the hens.* So many eggs of superior food value are being produced today, however, that it is time to begin emphasizing the food value of eggs. An egg is a good egg because of superior food value as well as when it possesses good appearance and excellent flavor.

It is also time for poultrymen and research workers to begin giving attention to the development of rations *which will enable hens to lay eggs of uniformly high food value, without increasing food costs much,* if any, above present levels. I predict that much will be done in this direction within the next few years.

When Wheat Follows Soybeans

Condensed from The Ohio Farmer

L. E. Thatcher

SOME farmers have reported to the Ohio Agricultural Experiment Station at Wooster that their wheat this year following soybeans harvested with a combine last year has yielded less than where the soybeans were harvested for hay.

The experiences of these farmers check with the results obtained at the experiment station this year. Last fall we sowed wheat on land from which soybeans had been harvested, (a) for hay, (b) combined and (c) harvested with a grain binder.

The wheat received 300 pounds per acre of 0-14-6 fertilizer. The preceding soybeans had received 150 pounds per acre of 0-14-6 fertilizer. The wheat on these plots was all sown on the same day, October 9. The yields of grain and straw were as follows:

Preceding Crop	Yield per acre Wheat Straw	
	Bu.	Lb.
(a) Soybean hay	36.9	3075
(b) Soybean grain, combined	27.7	2175
(c) Soybean grain, binder harvest	34.3	2800

It was evident in March and April that the wheat on the combined plot was suffering from a lack of nitrogen. The color was light green whereas that of the other plots was a vigorous dark green. The wheat following combined soybeans made a shorter straw growth than the others.

Lack of Soil Nitrogen

Here at the experiment station we have long since come to the conclusion that crops following soybeans do not benefit from the soybean residues anything like they do from clover, alfalfa, or sweet clover residues; however, we seldom get the striking reduction in yield that was obtained this year following the combined soybeans.

An explanation may be found in the effect of the weather last fall and this spring coupled with the effect of the soybean straw (which is relatively low in nitrogen) upon the fall and spring development of nitrate nitrogen in the soil.

The weather last fall and spring in parts of Ohio was not favorable to an abundant development of soil nitrate nitrogen. At Wooster soil samples taken in March showed 21 parts per million of nitrate and ammonium nitrogen. We normally expect about 30 to 35 parts per million.

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Another bit of evidence to show the low available nitrogen content of the soil this spring is that afforded by the wheat fertilizer tests in which nitrogen fertilizers showed more than normal effect in increasing the wheat yield.

It is likely that the depressing effect of the soybean straw from the combine was more pronounced this year than normal.

The composition of soybean straw, however, needs to be considered also, since the accumulation of soil nitrate nitrogen resulting from the decomposition of crop residues is influenced largely by the ratio of nitrogen to carbon in the residues.

The length of this article will not permit a full discussion of the reasons for this, but a brief statement of the facts may be helpful.

The mature straw and stubble of the cereal grains, of corn stover and stubble and similar non-leguminous mature residues contain about one part of nitrogen to 80 parts of carbon. These materials when incorporated into the soil are decomposed or rotted down by soil bacteria which use the plant material for food. In order to balance up their rich carbohydrate food, the soil bacteria draw upon any nitrate nitrogen in the soil; thus depleting its supply.

Residues of the biennial or perennial legumes such as alfalfa or clover sods or sweet clover roots or green succulent sweet clover or young cereal green manures contain about one part of nitrogen to 20 parts of carbon. When these decompose in the soil there is enough or more nitrogen in the residues to satisfy the soil bacteria so that the supply of soil nitrate nitrogen is not depleted, in fact, the soil may increase its supply when these nitrogen-rich residues are decomposed.

Soybean straw is intermediate between these two groups of low and high nitrogen crop residues. It contains about one part of nitrogen to 30 parts of carbon. When such material is decomposed in the soil there may be some draft on the soil for nitrate nitrogen. Consequently, a wheat crop planted in such a soil may suffer from a nitrogen deficiency, especially if weather conditions have not been favorable to the accumulation of a goodly supply of soil nitrate nitrogen. To be on the safe side, it would be advisable to fertilize the wheat with a complete fertilizer containing two to four percent nitrogen, such as a 2-14-6, or 4-10-6 at the rate of 250 to 300 pounds per acre.

It might be noted in passing that the stand of clover sown in the wheat this spring on the Wooster plots is much better where the soybeans were combined than on the other plots.

"Bacon for Breakfast"

Condensed from New England Homestead

Cliff Clevenger

MANY changes have taken place, customs and tastes are different, and a new type hog has been developed to meet the demand for lean meat. The Danes were pioneers in this work, starting three-quarters of a century ago when they were faced with much the same problem with which New England farmers are confronted now—that of finding a market for surplus milk. They had to produce a product which would meet the requirements of a discriminating export trade, and how well they succeeded is shown by the fact that their bacon and butter is the standard by which all others are measured in the English market. Closer home, we have the Canadian producers, who were, until recently, unable to compete with the Danes on the English market. In the past few years, however, they have made such rapid progress that Canadian produced Wiltshire sides have a definite place on British markets. Most of these pigs are raised on farms where dairy cows are kept. Skimmilk, oats, barley and wheat by-products form a large part of their ration and many growers send prime 220-lb. hogs to market at six months of age.

The Canadian government officials were quick to recognize the importance of quality and have rendered invaluable service to the growers by establishing testing stations, working out delivery schemes, inaugurating rail and carcass grading and advising on the general care and feeding and marketing problems. The testing stations are maintained at convenient points, and in order to compete, a breeder must notify his county agent when a sow farrows. The pigs are marked and recorded and at 70 days of age, four barrows from the litter are taken to the station where they are placed in a pen by themselves, fed a regular ration, and accurate records are kept. When they reach the proper weight, they are slaughtered under inspection, dressing percentage is noted, the carcass is graded and a final rating is obtained by combining all factors—prolificacy, rate of gain, cost of gain, dressing percentage, and quality of carcass. The aim of all breeders is to produce an animal that grows rapidly, turns out a high

Reprinted by permission from the New England Homestead, Sept. 10, 1938, Springfield, Mass.

dressing carcass with a minimum of lard, for which a profitable market no longer exists, and a maximum of lean meat, as shown by well-streaked bacon, large loins and full round hams. Several breeds have been tried but the Yorkshire seems best adapted and attention is focused on this breed. Recently some Swedish Landrace and English Large White pigs have been brought over and results will be checked carefully. Needless to say rapid progress is being made and the demand of their quality products is increasing.

Streamlining a Rotation

Condensed from Capper's Farmer

Sam Bridges

GENERATIONS have proved the standard Corn Belt rotations. Experience has developed no practical cropping system that is better for the land. John K. Knoop knew that. But he also knew the old sequences of corn, oats, wheat and clover were conceived in the days when human labor was cheap and men bragged about the hours they kept. Virtue was considered to abide in weary muscles.

Those rotations became standard because they were right. Custom decreed a feeding enterprise involving harvested crops with manure as a by-product to be returned to the land. That system preserved untold acres of land. It also bent untold backs, because oats had to be harvested, clover made into hay, corn cut and shocked, usually by hand, to provide both roughage and concentrate for winter feeding. Wheat was the cash crop.

It was a high labor requirement system and, projected into these times, still is, except as modern equipment may be employed to reduce production and harvesting expense. Mr. Knoop mechanized his operations as extensively as seemed practical, but even so more work was involved than high costs and low prices would admit.

He didn't want to disturb the rotation on his Miami county, Ohio, farm more than was necessary. Its soil protective features had to be retained. But it was just as necessary to find ways of crop utilization that would reduce labor requirements.

Default of Red clover, beginning some years before, had threatened to force abandonment of rotations which included it.

Reprinted by permission from Capper's Farmer, May, 1938, Topeka, Kansas

However, substitutes had been and are still being found, some not so good, some quite as good. In cases the shift has occasioned a reduction in labor and in others there has been little if any change.

Of all substitutes, sweet clover seemed best adapted to Mr. Knoop's requirements. It automatically eliminated one labor consuming operation, hay making from the rotation seeding acres. But at the same time it raised another problem, that of utilization, a means of cashing the crop.

His solution is explained by practices he is following now. Yearling whitefaces, the best he can buy, are delivered in April to be grazed on the rotation seeding. To avoid one of the major objections to sweet clover as a pasture crop, maturity in mid-season, he mixes timothy with it. That affords grazing under one fence from early spring until late fall except a short summer period after clover seeds and the grass may be dormant. The combination also supplies variety, offers some assurance against bloat from clover alone, and, a minor consideration perhaps, makes the sod easier to plow.

Mechanization of power reduced labor requirements materially and eliminated the necessity for horse oats. The rotation now practiced includes one year of corn, one of wheat and one of mixture. To avoid cutting up corn, a common practice in the territory, he uses a corn picker. Following corn with wheat requires getting the crop off early. His first planting of corn is Woodburn which is ready to husk by October 1. That is essentially the date for sowing wheat. With plenty of tractor power he is able to start tandem disking right behind the picker. As soon as a field is finished, he cross disks and then works it again the long way just ahead of the drill.

"I can pick about 7 acres a day," he explained. "Normally about a month is required to get the crop out, before bad weather sets in, but two years I have been delayed and did not finish wheat sowing until December 1. The yield wasn't quite so good as that sowed earlier but it was fully equal to the average of stalk land wheat."

Steers are turned into the fields to glean any corn missed by the picker. Timothy is sowed with the wheat and sweet clover on it the following spring. Old seeding is plowed after the grazing season or the next spring to be followed by corn.

His feeding plant at the home place will handle about 100 head. It consists of a concrete floored lot 80 by 90 feet, a 20 by 74 foot shed with a feeder at each end on the west side and a barn on the north. Alfalfa hay is available

from one inside and two outside racks. The lot is covered with straw during the feeding period. The steers may go from the plant to any field or pasture for grazing or to a clear, swift running creek for water.

With that lot arrangement, he is in position to shut the cattle up and feed any time pastures become inadequate. Normally he feeds on the early fall grass, but keeps the steers up after November 1. They are carried thru winter to be finished by spring or about the time another lot is purchased for grazing. As a means of utilizing excess pasture or feed he buys heavy steers as occasion demands for short feed.

In making up the grain ration, which is prepared with equipment in his own barn, he adds to 50 bushels of corn and cob meal, two 100 pound bags of cottonseed meal, 6 bags of ground barley to which has been added all the molasses it will soak up, 10 pounds powdered limestone, 10 pounds of salt and about 5 gallons of rich, black dirt. This last ingredient, he asserts, satisfies certain mineral needs, the lack of which is expressed by licking harness or buildings and chewing wood. Alfalfa hay supplies roughage.

Fly Away Home

IN Arizona, last year, melon growers spent several hundred dollars for millions of ladybugs which they turned loose in their fields to eat up plant lice. The ladybugs promptly flew away. In northern Utah and southern Idaho, pea growers bought about 5,000,000 ladybugs to attack pea aphids, and a short time later few remained. In the larval stage, they require a source of water, and adult ladybugs will go long distances to provide it.—*The Furrow*

Limestone Feeding

Condensed from Kansas Farmer

OF all the valuabde methods tried and tested by the animal husbandry department of Kansas State College, the most far reaching in Kansas is the system of feeding powdered limestone to beef cattle.

In practice this means a substitution for the calcium in alfalfa or clover hay, which was once considered almost necessary to profitable cattle fattening.

When Dr. C. W. McCampbell, department head, agreed that the limestone work was most important, he recalled the response its first announcement brought forth as long as 10 years ago. Expressions of opinions, that beef could be made profitably from rocks, ranged from noncomment to frank scoffing of the idea.

But today, a good many states are placing great emphasis on feeding calcium, in one form or another. And some of the country's greatest authorities on nutrition strongly recommend the practice where leguminous hays are not available.

The idea of supplying calcium in some form other than alfalfa came to members of the animal husbandry department after a series of experiments with calves in 1920-21 and 1924-25. In these tests calves fed a normal "Corn-Belt" ration including alfalfa, silage, corn and cottonseed, made decidedly more profitable gains than those from whose ration the alfalfa was omitted.

Also in the 1924-25 tests, other trials were made in which alfalfa was fed at the rate of 2 pounds a day toward the latter part of the feeding period. The result was much improvement in the total gain and considerable increase in selling value.

All scientific evidence pointed to calcium deficiency in the alfalfaless rations, so the powdered limestone feeding series was begun. By 1931 it had been definitely proved that a tenth of a pound daily of powered limestone would supply the necessary calcium for a feeding steer. The protein content is made up with one or more pounds of cottonseed meal or other such concentrate.

Reprinted by permission from the Kansas Farmer, Sept. 10, 1938

World Champion Producers

Butter Fat

Name of Animal	*Breed*	*Pounds Milk*	*Pounds Fat*	*Owner*
Melba 15th of Darbalara	Milking Shorthorn	32,522	1614.0	Scottish Australian Inv. Co., Darbalara, Australia
Carnation Ormsby Butter King	Holstein	38,606	1402.0	Carnation Stock Farm, Seattle, Wash.
Brampton Basilua	Jersey	19,012	1312.80	B. H. Bull & Son, Brampton, Ont.
Grange Rosebud 2nd	Ayrshire	26,766	1306.66	Col. A. F. Nicholson, Leek, England
Noranda's Milkmaid	Guernsey	19,654	1155.8	R. F. Locke, Cressy, Mich.
Mary's Nell	Brown Swiss	29,487	1109.71	V. C. Hull, Painesville, O.
Jean Duluth Beauty	Red Polled	20,280	891.58	Jean Duluth Farms, Duluth, Minn.
Loraine of Brunswick	Dutch Belted	18,211	816.52	J. A. Wilson, Brunswick, Me.
Dolly Dartmouth	Devon	14,472	601.84	E. H. Marshall, Hanover, N. H.

Milk

Carnation Ormsby Butter King	Holstein	38,606	1402.0	Carnation Stock Farm, Seattle, Wash.
Melba 15th of Darbalara	Milking Shorthorn	32,522	1614.0	Scottish Australian Inv. Co., Darbalara, Australia
Mary's Nell	Brown Swiss	29,487	1109.71	V. C. Hull, Painesville, O.
Nellie Osborne of Elm Shade 6th	Ayrshire	27,198	1257.0	W. C. Wylie, Howick, Que.
Stonehurst Patrician's Lily	Jersey	24,094	1087.24	S. S. Lockwood, England
Murne Cowan	Guernsey	24,008	1098.18	Est. O. C. Barber, Barberton, O.
Jean Duluth Beauty	Red Polled	20,280	891.58	Jean Duluth Farms, Duluth, Minn.
Loraine of Brunswick	Dutch Belted	18,211	816.52	J. A. Wilson, Brunswick, Me.
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of the Farmers Digest, published monthly at Ambler, Penna. for October 1, 1938

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared L. Bush-Brown, who, having been duly sworn according to law, deposes and says that he is the Editor of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor and managing editors are: Publisher, The School of Horticulture, Ambler, Penna.; Editor, L. Bush-Brown, Ambler, Penna.; Associate Editors are: Publisher, The School of Horticulture, Ambler, Penna. 2. That the owners is: L. Bush-Brown, Ambler, Penna. C. L. Dyer, New Hope, Penna.; A. E. Hetck, Ambler, Penna. 3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, L. Bush-Brown, Editor. Sworn to and subscribed before me this 29th day of September, 1938 (Seal). E. Mildred Miller, Notary Public. (My commission expires February 7, 1941.)

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NO ONE CAN DO YOUR READING FOR YOU

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